HIGHLIGHTS

REVISION NO. 33 Jun 01/10

Pages which have been revised are outlined below, together with the Highlights of the Revision

CH/SE/SU C PAGES	REASON FOR CHANGE	EFFECTIVITY
CHAPTER 79		
L.E.P. 1- 3	Revised to Reflect this revision indicating new,revised, and/or deleted pages	
79-00-00 608- 610	Minor additions and amplification **REPLACED RED DYE BY BLUE DYE.**	
79-21-05 401- 403, 412, 415- 424	Minor, non technical corrections **FURTHER TO TR PW 79-2** Minor additions and amplification **REVISED INSTALLATION PROCEDURE TO SPECIFY MINIMUM LOOSENING TORQUE LIMIT FOR TUBE NUTS.**	
79-22-03 605- 607, 620	Minor additions and amplification	
79-33-11 401- 402	Minor additions and amplification **ADDED A POSTREQUISITE TO DO A LEAK TEST.**	

CHAPTER 79

OIL

LIST OF EFFECTIVE PAGES

N, R or D indicates pages which are New, Revised or Deleted respectively
Remove and insert the affected pages and complete the Record of Revisions and the Record of Temporary Revisions as necessary

CH/SE/SU	C	PAGE	DATE
RECORD			
OF TEMP.			
REVISION			
L.E.P.	R	1- 3	Jun01/10
T. of C.		1	Dec01/06
T. of C.		2	Jun01/09
T. of C.		3	Jun01/09
T. of C.		4	Dec01/06
79-00-00		1	Jun01/04
79-00-00		2	Jun01/04
79-00-00		3	Jun01/04
79-00-00		4	Jun01/04
79-00-00		5	Jun01/04
79-00-00		6	Jun01/04
79-00-00		7	Jun01/04
79-00-00		8	Jun01/04
79-00-00		9	Jun01/04
79-00-00		10	Jun01/04
79-00-00		11	Jun01/04
79-00-00		12	Jun01/04
79-00-00		601	Jun01/07
79-00-00		602	Jun01/07
79-00-00		603	Jun01/07
79-00-00		604	Jun01/07
79-00-00		605	Jun01/07
79-00-00		606	Jun01/07
79-00-00		607	Jun01/07
79-00-00	R	608	Jun01/10
79-00-00	R	609	Jun01/10
79-00-00	R	610	Jun01/10
79-00-00		701	Jun01/04
79-11-00		1	Jun01/04
79-11-00		2	Jun01/04
79-11-00		3	Jun01/04
79-11-00		4	Jun01/04
79-11-00		5	Jun01/04
79-11-00		6	Jun01/04
79-11-00		7	Jun01/04
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79-11-00		402	Jun01/04
79-11-00		403	Jun01/04
79-11-00		404	Jun01/04
79-11-00		405	Jun01/04
79-11-00		406	Jun01/04
79-11-00		407	Jun01/04
79-11-00		408	Jun01/04
79-11-00		409	Dec01/06
79-11-02		401	Jun01/04
79-11-02		402	Jun01/04
79-11-02		403	Jun01/04
79-11-02		404	Jun01/04
79-11-03		401	Jun01/04
79-11-03		402	Jun01/04
79-21-00		1	Jun01/04
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79-21-00		4	Jun01/04
79-21-00		5	Jun01/04
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79-21-00		10	Dec01/06
79-21-00		11	Dec01/06
79-21-00		12	Dec01/06
79-21-00		13	Jun01/04
79-21-00		14	Dec01/06
79-21-00		15	Jun01/04
79-21-00		16	Jun01/04
79-21-00		17	Jun01/04
79-21-00		18	Jun01/04
79-21-00		19	Jun01/04
79-21-00		20	Jun01/04
79-21-00		21	Jun01/04
79-21-00		22	Jun01/04
79-21-00		23	Dec01/06
79-21-00		24	Jun01/04
79-21-00		25	Jun01/06
79-21-02		401	Jun01/08
79-21-02		402	Jun01/04
79-21-02		403	Jun01/04
79-21-02		404	Jun01/04
79-21-02		405	Jun01/08
79-21-02		406	Jun01/08
79-21-02		407	Jun01/04
79-21-02		408	Jun01/04
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79-21-02		413	Jun01/04
79-21-02		414	Jun01/04
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79-21-03		401	Jun01/04
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79-21-03		411	Jun01/04
79-21-03		412	Jun01/04
79-21-03		413	Jun01/04
79-21-03		414	Jun01/04
79-21-03		415	Jun01/04
79-21-03		416	Dec01/06
79-21-03		417	Jun01/04
79-21-04		401	Jun01/08
79-21-04		402	Jun01/08
79-21-04		403	Jun01/04
79-21-04		404	Jun01/04
79-21-04		405	Jun01/04
79-21-05	R	401	Jun01/10
79-21-05	R	402	Jun01/10
79-21-05	R	403	Jun01/10
79-21-05		404	Jun01/04
79-21-05		405	Jun01/04
79-21-05		406	Jun01/04
79-21-05		407	Jun01/04

CH/SE/SU	C	PAGE	DATE
79-21-05		408	Jun01/04
79-21-05		409	Jun01/04
79-21-05		410	Jun01/04
79-21-05		411	Jun01/04
79-21-05	R	412	Jun01/10
79-21-05		413	Jun01/04
79-21-05		414	Jun01/04
79-21-05	R	415	Jun01/10
79-21-05	R	416	Jun01/10
79-21-05	R	417	Jun01/10
79-21-05	R	418	Jun01/10
79-21-05	R	419	Jun01/10
79-21-05	R	420	Jun01/10
79-21-05	R	421	Jun01/10
79-21-05	R	422	Jun01/10
79-21-05	R	423	Jun01/10
79-21-05	R	424	Jun01/10
79-21-05		425	Dec01/06
79-21-05		426	Dec01/06
79-21-05		427	Dec01/06
79-21-05		428	Dec01/06
79-21-05		429	Dec01/06
79-21-07		401	Jun01/04
79-21-07		402	Jun01/04
79-21-07		403	Jun01/04
79-21-08		401	Jun01/04
79-21-08		402	Dec01/06
79-21-08		403	Jun01/04
79-21-10		401	Jun01/04
79-21-10		402	Jun01/04
79-21-10		403	Jun01/04
79-21-10		404	Jun01/04
79-21-10		405	Jun01/04
79-21-10		406	Jun01/04
79-21-10		407	Jun01/04
79-21-10		408	Jun01/04
79-21-10		409	Jun01/04
79-21-10		410	Jun01/04
79-21-10		411	Jun01/06
79-21-10		412	Jun01/04
79-21-10		413	Jun01/06
79-21-11		401	Jun01/04
79-21-11		402	Jun01/04
79-21-11		403	Jun01/04
79-21-12		401	Jun01/08
79-21-12		402	Jun01/04
79-21-12		403	Jun01/08
79-21-12		404	Jun01/04
79-21-12		405	Jun01/04
79-21-12		406	Jun01/04
79-21-12		407	Jun01/04
79-21-12		408	Jun01/04
79-21-12		409	Jun01/04
79-21-12		410	Jun01/08
79-21-12		411	Jun01/04
79-21-12		412	Jun01/08
79-21-12		413	Jun01/08
79-21-12		414	Jun01/08
79-21-12		415	Jun01/04
79-21-12		416	Jun01/04
79-21-12		417	Jun01/08
79-21-12		418	Jun01/04
79-21-41		401	Jun01/08
79-21-41		402	Jun01/04
79-21-41		403	Jun01/08
79-21-41		404	Jun01/08
79-21-41		405	Jun01/04
79-21-41		406	Dec01/06
79-21-41		407	Jun01/08
79-21-41		408	Dec01/06
79-21-41		409	Dec01/06
79-21-41		410	Dec01/06
79-21-41		411	Jun01/04
79-21-41		412	Jun01/04
79-21-41		413	Jun01/04
79-21-41		414	Jun01/04
79-21-41		415	Dec01/06
79-21-41		416	Jun01/04
79-21-41		417	Jun01/04
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79-22-03		407	Dec01/06
79-22-03		408	Dec01/06
79-22-03		409	Dec01/06
79-22-03		410	Dec01/06
79-22-03		411	Dec01/06
79-22-03		412	Dec01/06
79-22-03		413	Dec01/06
79-22-03		414	Dec01/06
79-22-03		415	Dec01/06
79-22-03		416	Dec01/06
79-22-03		417	Jun01/04
79-22-03		601	Jun01/09
79-22-03		602	Jun01/09
79-22-03		603	Jun01/09
79-22-03		604	Jun01/09
79-22-03	R	605	Jun01/10
79-22-03	R	606	Jun01/10
79-22-03	R	607	Jun01/10
79-22-03		608	Jun01/09
79-22-03		609	Jun01/09
79-22-03		610	Jun01/09
79-22-03		611	Jun01/09
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79-22-03		615	Jun01/09
79-22-03		616	Jun01/09
79-22-03		617	Jun01/09
79-22-03		618	Jun01/09
79-22-03		619	Jun01/09
79-22-03	R	620	Jun01/10
79-23-00		1	Jun01/04
79-23-01		401	Jun01/04
79-23-01		402	Jun01/04
79-23-01		403	Jun01/04
79-23-01		404	Jun01/04
79-23-01		405	Jun01/04
79-23-03		401	Jun01/04
79-23-03		402	Jun01/04
79-23-04		401	Dec01/06
79-23-04		402	Dec01/06
79-23-04		403	Dec01/06
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79-30-00		3	Dec01/06
79-31-00		1	Jun01/04
79-31-00		2	Jun01/04
79-31-00		3	Jun01/04
79-31-00		4	Jun01/04
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79-31-00		501	Jun01/04
79-31-00		502	Jun01/04
79-31-01		401	Jun01/04
79-31-01		402	Jun01/04
79-31-11		401	Jun01/04
79-31-11		402	Jun01/04
79-31-11		403	Jun01/04

CH/SE/SU	C	PAGE	DATE
79-32-00		1	Jun01/04
79-32-00		2	Jun01/04
79-32-00		3	Jun01/04
79-32-00		4	Jun01/04
79-32-00		5	Jun01/04
79-32-11		1	Jun01/04
79-32-11		2	Jun01/04
79-32-11		401	Jun01/04
79-32-11		402	Jun01/04
79-32-11		601	Jun01/04
79-32-11		602	Jun01/04
79-32-13		401	Jun01/04
79-32-13		402	Jun01/04
79-33-00		1	Jun01/04
79-33-00		2	Jun01/04
79-33-00		3	Jun01/04
79-33-00		4	Jun01/04
79-33-00		5	Jun01/04
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79-33-00		7	Jun01/04
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79-33-00		502	Jun01/04
79-33-00		503	Jun01/04
79-33-00		504	Jun01/04
79-33-00		505	Jun01/04
79-33-11	R	401	Jun01/10
79-33-11	R	402	Jun01/10
79-33-11		403	Jun01/04
79-33-21		401	Jun01/04
79-33-21		402	Jun01/04
79-33-21		403	Jun01/04
79-34-11		401	Jun01/04
79-34-11		402	Jun01/04
79-34-11		403	Jun01/04
79-35-00		1	Jun01/09
79-35-00		2	Jun01/04
79-35-00		3	Jun01/04
79-35-00		4	Jun01/09
79-35-00		5	Jun01/04
79-35-00		501	Jun01/04
79-35-00		502	Jun01/04
79-35-00		901	Jun01/07
79-35-11		401	Jun01/04
79-35-11		402	Jun01/04
79-35-11		403	Jun01/04

CHAPTER 79

OIL

TABLE OF CONTENTS

SUBJECT	CH/SE/SU	C	PAGE	EFFECTIVITY
OIL - GENERAL	79-00-00			
Description and Operation			1	101-200,
Oil System Components			1	101-200,
Oil Specifications			1	101-200,
Warning and Indicating System			1	101-200,
Inspection/Check			601	101-200,
Specified Fits and Clearances			601	101-200,
Engine Oil System External Part Examination			604	101-200,
Visually Examine the Oil System for Leaks			608	101-200,
Cleaning/Painting			701	101-200,
Cleaning Requirements After Chemical Contact With Oil			701	101-200,
OIL TANK	79-11-00			
Description and Operation			1	101-200,
General			1	101-200,
Oil Tank Equipment			1	101-200,
Removal/Installation			401	101-200,
OIL TANK CAP	79-11-02			
Removal/Installation			401	101-200,
ENGINE OIL TANK PRESSURE FILL SYSTEM	79-11-03			
Removal/Installation			401	101-200,
SUPPLY	79-21-00			
Description and Operation			1	101-200,
General			1	101-200,
Component Location			7	101-200,
Component Location			7	101-104,
Lubrication and Scavenge Oil Pump			11	101-200,
Main Oil Filter			11	101-200,
Lubrication and Scavenge Oil Pump			12	101-104,
Main Oil Filter			12	101-104,
Fuel/Oil Cooler			12	101-200,
Fuel/Oil Cooler Bypass Valve and Solenoid			18	101-200,
Air/Oil Exchanger and Valve (Engine)			18	101-200,
Oil Filter Pressure Relief Valve			21	101-200,
Oil Filter Pressure Relief Valve			23	101-104,
Bearing Lubrication and Last Chance Oil Strainers			24	101-200,
LUBRICATION AND SCAVENGE OIL PUMP	79-21-02			
Removal/Installation			401	101-200,
OIL FILTER	79-21-03			
Removal/Installation			401	101-200,
OIL PRESSURE REGULATOR VALVE	79-21-04			

SUBJECT	CH/SE/SU	C	PAGE	EFFECTIVITY
Removal/Installation			401	101-200,
FUEL/OIL COOLER	79-21-05			
Removal/Installation			401	101-200,
FUEL/OIL COOLER BYPASS VALVE	79-21-07			
Removal/Installation			401	101-200,
MAIN OIL FILTER PRESSURE RELIEF VALVE	79-21-08			
Removal/Installation			401	101-200,
Removal/Installation			402	101-104,
LAST CHANCE STRAINERS ELEMENTS	79-21-10			
Removal/Installation			401	101-200,
No. 1, 1.5, and 2 Bearing Oil Pressure Strainer			401	101-200,
Angle and Main Gearbox Strainer			403	101-200,
No. 3 Bearing Oil Pressure Strainer			403	101-200,
No. 4 Bearing Oil Pressure Strainer			411	101-200,
FUEL/OIL COOLER BYPASS VALVE SOLENOID	79-21-11			
Removal/Installation			401	101-200,
AIR/OIL HEAT EXCHANGER AND VALVE (ENGINE)	79-21-12			
Removal/Installation			401	101-200,
Air/Oil Heat Exchanger and Valve			401	101-200,
Valve from Air/Oil Heat Exchanger			413	101-200,
HOUSING ASSEMBLY -	79-21-41			
Removal/Installation			401	101-200,
SCAVENGE	79-22-00			
Description and Operation			1	101-200,
General			1	101-200,
Scavenge Pumps			1	101-200,
Magnetic Chip Collectors			1	101-200,
MAGNETIC CHIP COLLECTORS	79-22-03			
Removal/Installation			401	101-200,
Inspection/Check			601	101-200,
Inspect the Magnetic Chip Collectors			601	101-200,
Spectroscopic Analysis of Chips and Flakes			607	101-200,
BREATHER SUPPLY VENT SYSTEM	79-23-00			
Description and Operation			1	101-200,
General			1	101-200,
Breather System			1	101-200,
Separation of the Air Mixed with the Oil			1	101-200,
Separation of Oil Droplets Suspended in Ambient Air			1	101-200,
DEOILER	79-23-01			
Removal/Installation			401	101-200,
DEOILER VENT DUCT	79-23-03			
Removal/Installation			401	101-200,
NO. 3 BEARING BREATHER AND RESTRICTOR VALVE	79-23-04			

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SUBJECT	CH/SE/SU	C	PAGE	EFFECTIVITY
Removal/Installation			401	101-105,
INDICATING	79-30-00			
Description and Operation			1	101-200,
General			1	101-200,
OIL QUANTITY INDICATION	79-31-00			
Description and Operation			1	101-200,
General			1	101-200,
Oil Tank Sight Gage			1	101-200,
Oil Quantity Transmitter			1	101-200,
Oil Quantity Indications			1	101-200,
Component Location			1	101-200,
Adjustment/Test			501	101-200,
OIL TANK SIGHT GAGE	79-31-01			
Removal/Installation			401	101-200,
OIL QUANTITY TRANSMITTER	79-31-11			
Removal/Installation			401	101-200,
OIL TEMPERATURE INDICATING	79-32-00			
Description and Operation			1	101-200,
Oil Temperature Indicating			1	101-200,
Oil Delta Temperature Indicating			1	101-200,
OIL TEMPERATURE SENSOR	79-32-11			
Description and Operation			1	101-200,
Removal/Installation			401	101-200,
Inspection/Check			601	101-200,
THERMOCOUPLE PROBE	79-32-13			
Removal/Installation			401	101-200,
OIL PRESSURE AND LOW OIL PRESSURE WARNING	79-33-00			
Description and Operation			1	101-200,
General			1	101-200,
Oil Pressure Transmitter			1	101-200,
Oil Pressure Indication			1	101-200,
Low Oil Pressure Switch			1	101-200,
Component Location			1	101-200,
Adjustment/Test			501	101-200,
Operational Test			502	101-200,
Accuracy test			502	101-200,
OIL PRESSURE TRANSMITTER	79-33-11			
Removal/Installation			401	101-200,
OIL PRESSURE AND QUANTITY DUAL INDICATOR	79-33-21			
Removal/Installation			401	101-200,
LOW OIL PRESSURE SWITCH	79-34-11			
Removal/Installation			401	101-200,
OIL FILTER CLOGGING INDICATING	79-35-00			
Description and Operation			1	101-200,
Description and Operation			1	101-104,
Component Location			1	101-200,
Adjustment/Test			501	101-200,

SUBJECT	CH/SE/SU	C	PAGE	EFFECTIVITY
Deactivation/Reactivation			901	101-200,
Ref. : MMEL Sect. 1-79, Item 4 ("OIL CLOG" lt.)			901	101-200,
OIL FILTER DIFFERENTIAL PRESSURE SWITCH	79-35-11			
Removal/Installation			401	101-200,

OIL - GENERAL - DESCRIPTION AND OPERATION

1. Purpose (Ref. Fig. 002, 003)
(Ref. Fig. 001)
(Ref. Fig. 004)
(Ref. Fig. 005)
The oil system provides and distributes lubricating oil within specified temperature and pressure limits to the engine main shaft bearings, to the main and angle gearboxes and the accessory drives. It also provides for the return of the lubrication oil to the oil tank through a scavenge system.

2. Oil System Components
To achieve the above functions, the oil system is equipped with :
- an oil tank
- an oil pressure pump with associated filter
- a fuel/oil heat exchanger in conjunction with a bypass valve
- an air/oil heat exchanger in conjunction with a bypass valve
- a pressure relief valve
- five scavenge pumps
- a deoiler and deaerator
- appropriate lines and fittings, which are made of fire proof materials
- associated line and instrumentation tappings (oil quantity pressure and temperature).

The oil system also includes four last chance screens, pressure relief and bypass valves to ensure flow is maintained, the two heat exchangers to maintain desired temperatures and a deoiler and deaerator remove oil droplets from breather air and entrained air from scavenge oil respectively.

3. Oil Specifications
(Ref. 70-00-00, P. Block 201)

4. Warning and Indicating System
Oil warnings and indicatings are displayed on indicators and on ECAM display units (CRTs) to the crew for monitoring purpose.
(Ref. Fig. 006, 007, 008) and (Ref. 79-30-00, P. Block 1).

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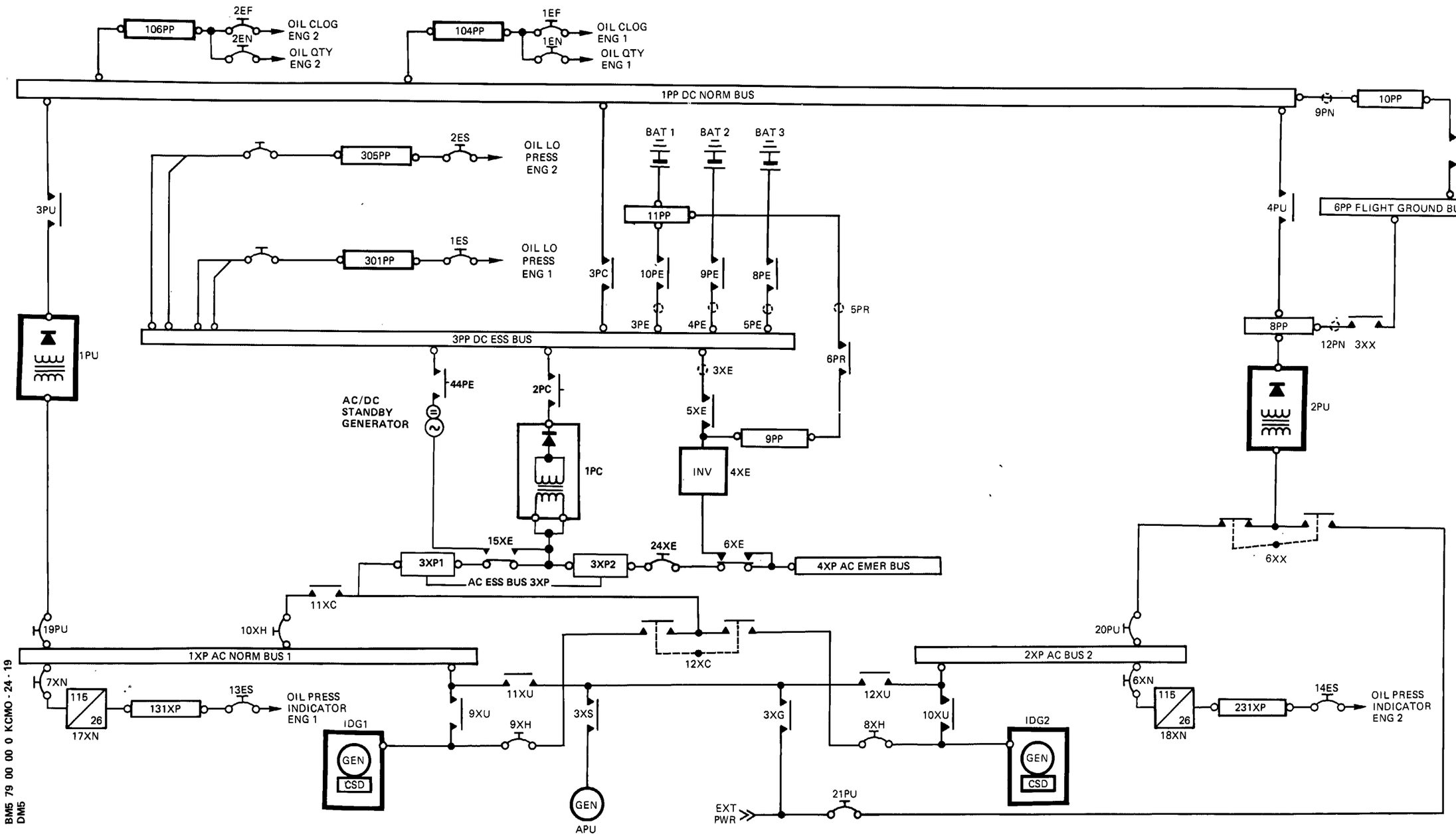

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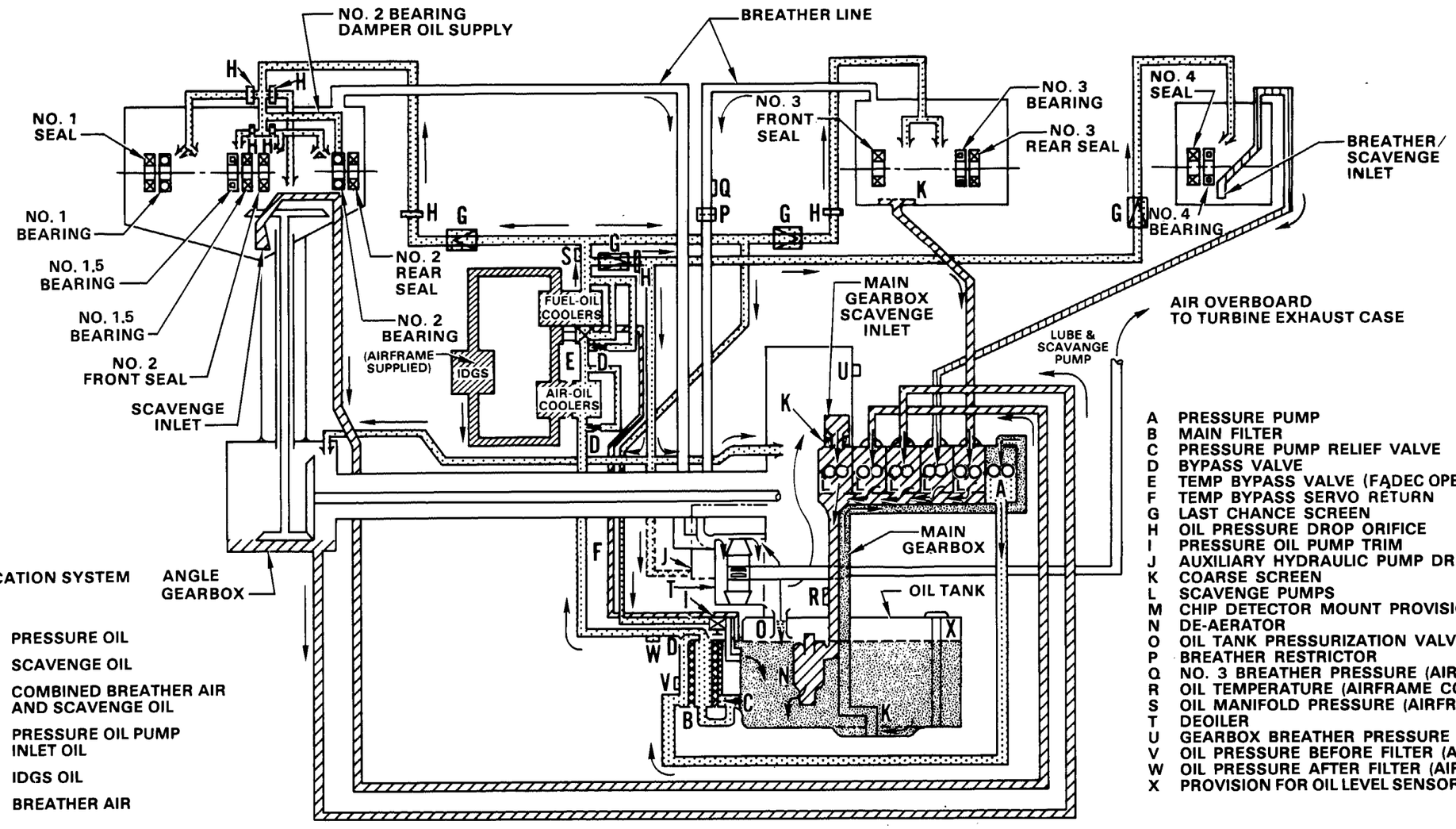
Oil System - Electrical Supply
Figure 001



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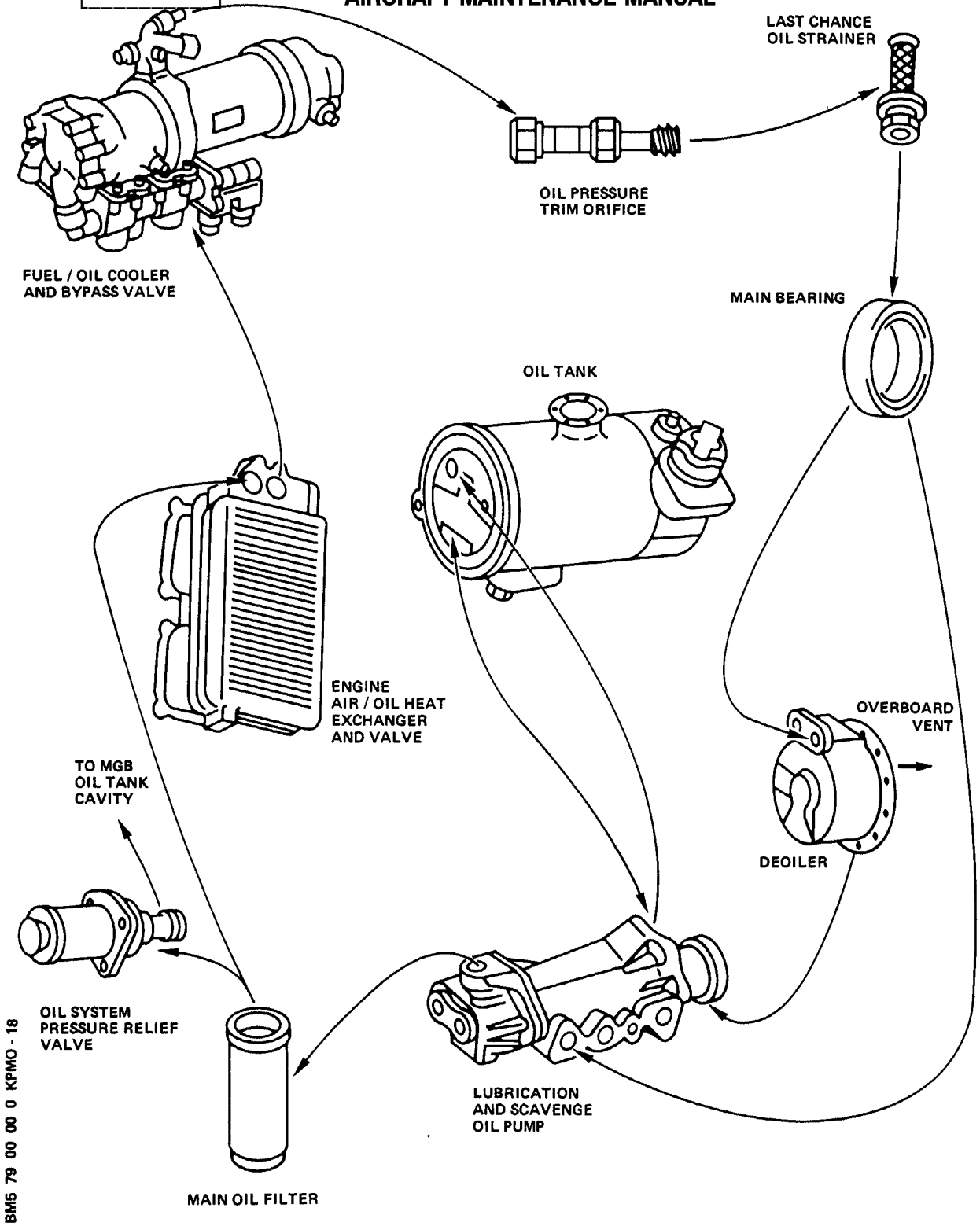
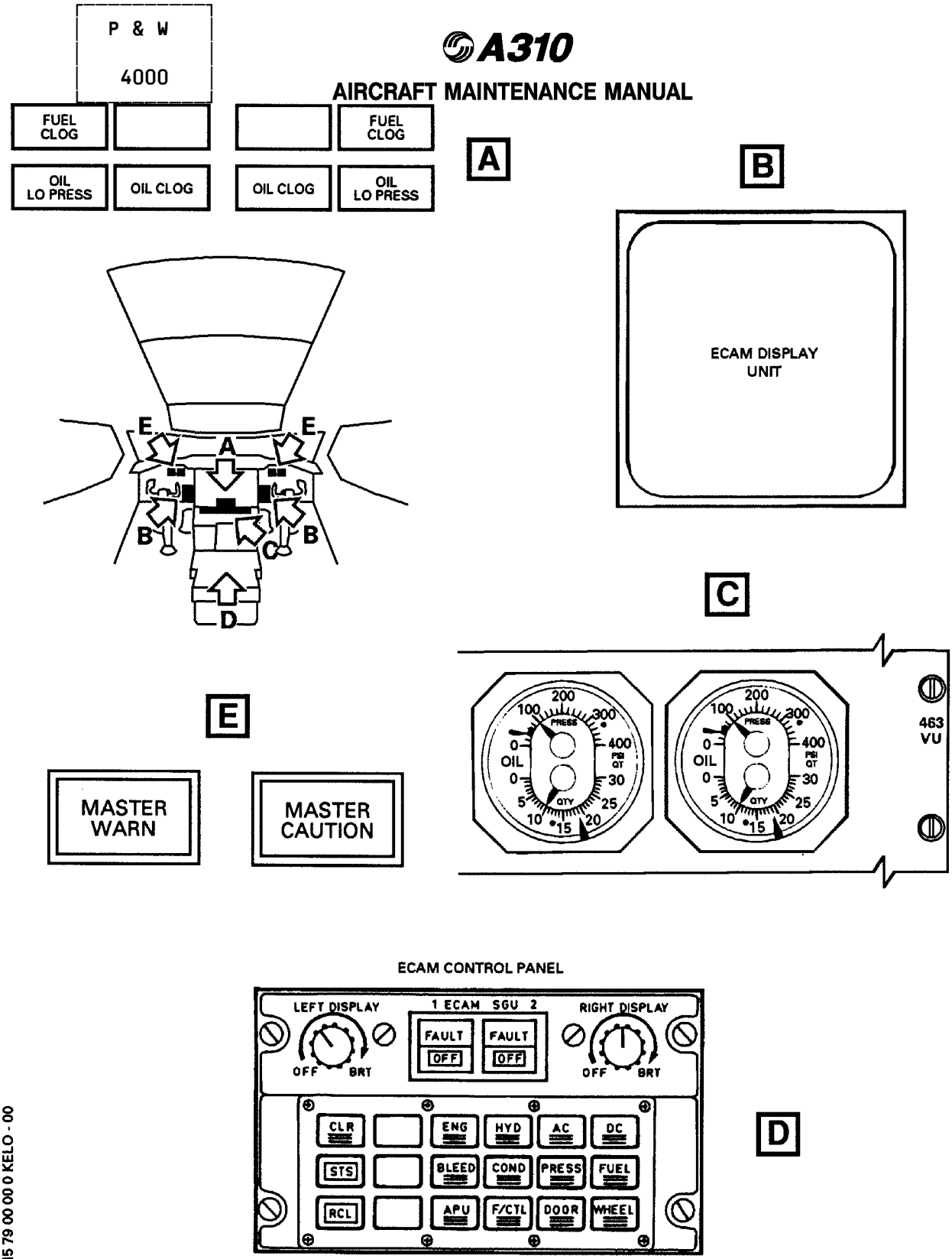
DM5

Oil System Schematic
Figure 002



Oil System - Components
Figure 003



ECAM CONTROL PANEL

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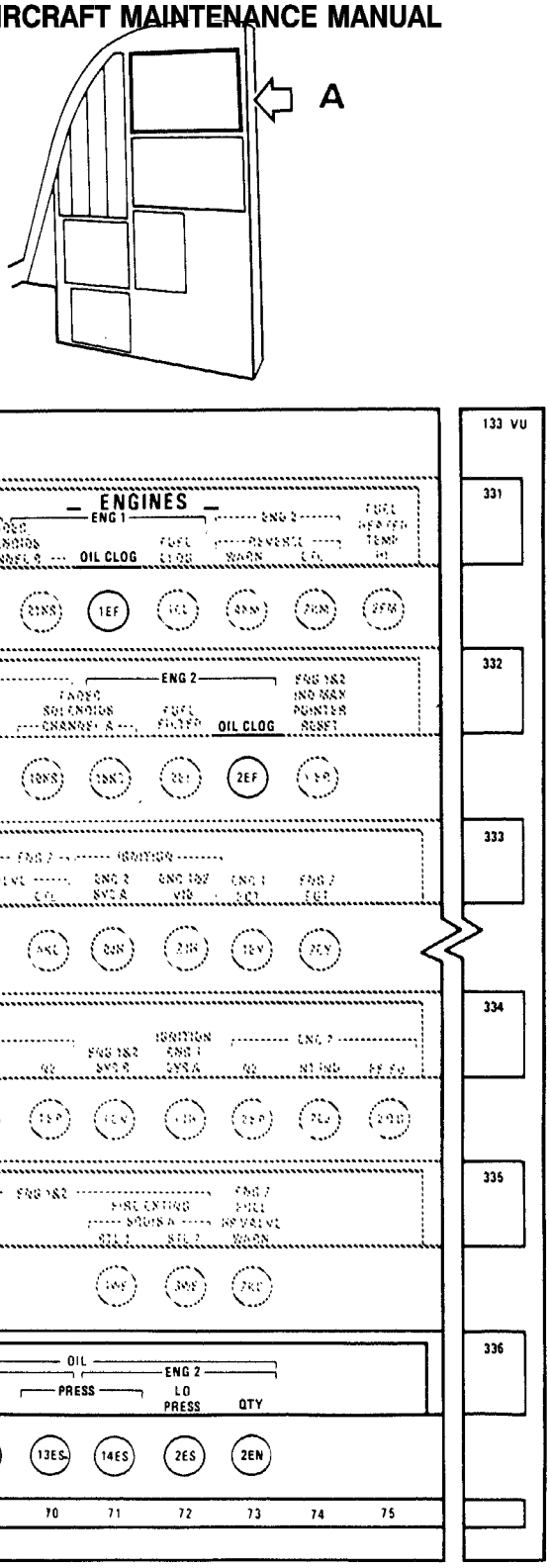
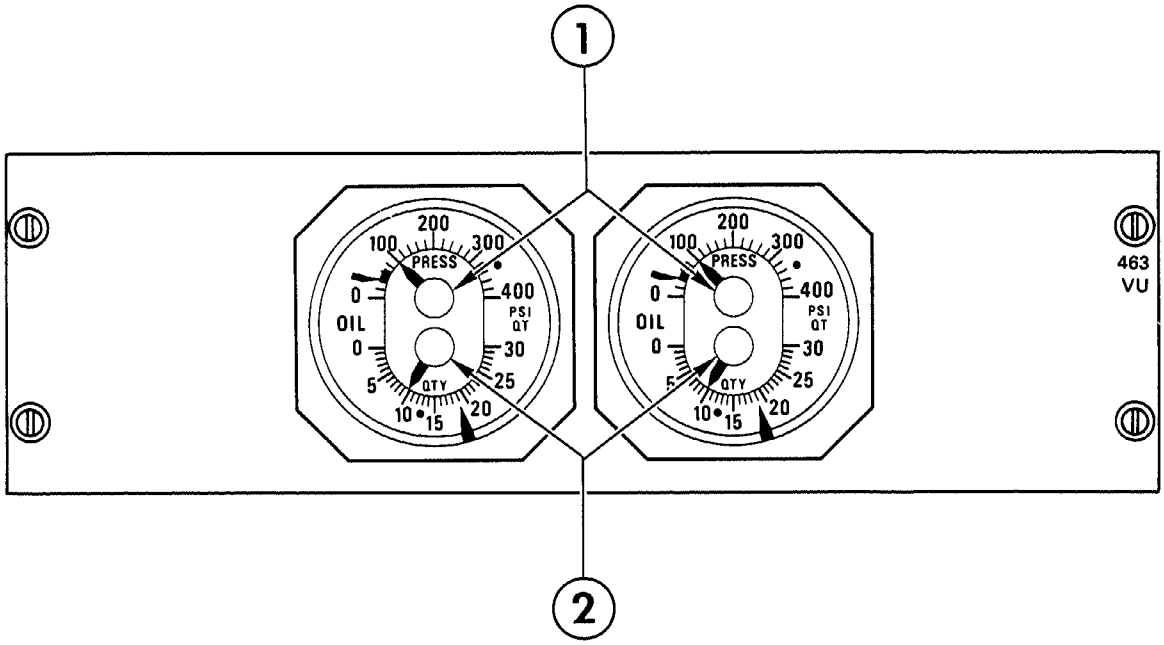
Component Location - Indications
Figure 004



Component Location - Circuit Breakers
Figure 005



1— OIL PRESSURE INDICATOR

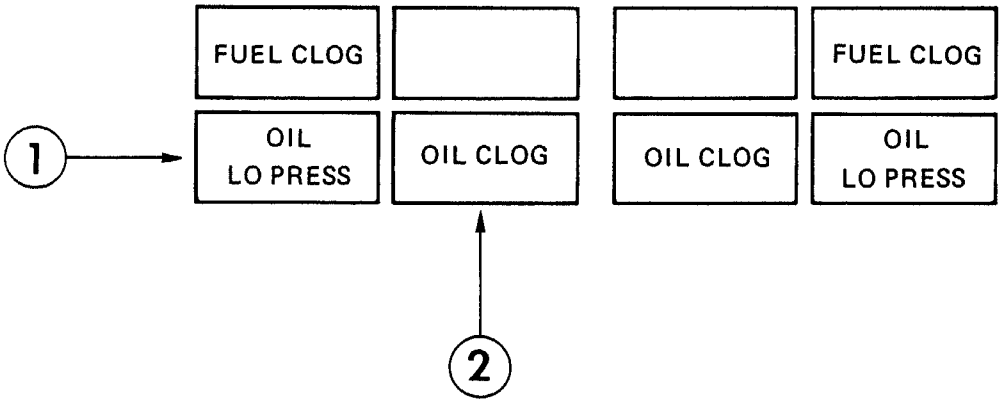
INDICATES OIL PRESSURE OF CORRESPONDING ENGINE, (RANGE O TO 400 PSI G)
RED LINE INDICATES MINIMUM OIL PRESSURE (≤ 70 PSI G)
BLUE POINT INDICATOR TEST (340 PSI G)

2 — OIL QUANTITY INDICATOR

INDICATES OIL QUANTITY OF CORRESPONDING ENGINE, ONE WHITE BUG ALLOW OIL CONSUMPTION OF EACH ENGINE TO BE MONITORED
(RANGE O TO 30 QTS OIL QUANTITY AND PRESSURE INDICATOR EFFECTIVE RANGE OTO 26 QTS)
BLUE POINT INDICATOR TEST (13 QTS)

BM5 79 00 00 0 KJMO - 00 19

Oil Quantity And Pressure Indicator
Figure 006

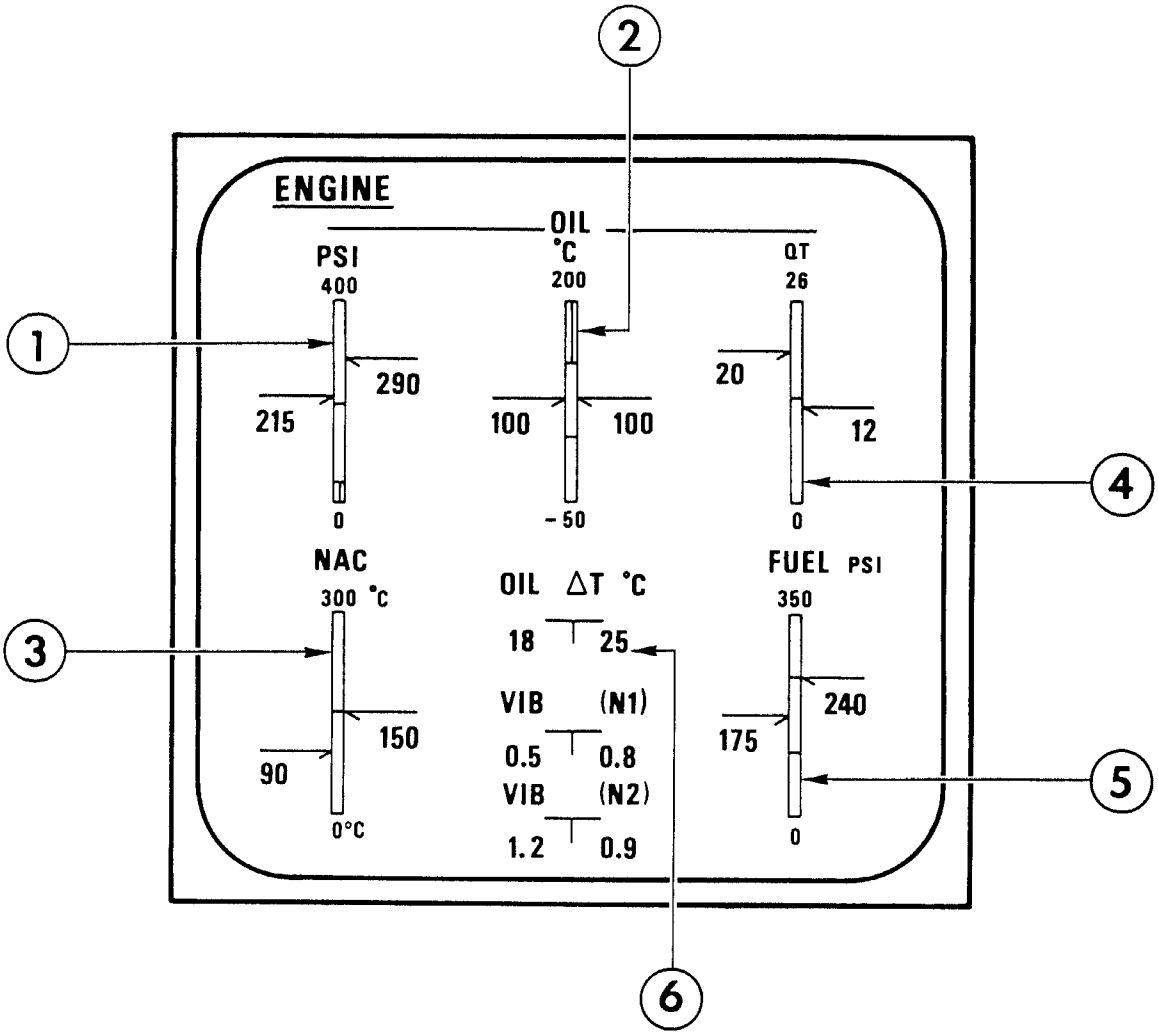


1— OIL LO PRESS WARNING LIGHT (RED)
INHIBITED WHEN CORRESPONDING HP FUEL VALVE LEVER AT OFF.
COMES ON IF OIL PRESSURE LESS THAN 70 PSI WITH ENGINE RUNNING.
ACCOMPANIED BY MASTER WARNING RED LIGHT AND CONTINUOUS REPETITIVE CHIME.
WARNING MESSAGE APPEARS ON LEFT ECAM DISPLAY
ENGINE PAGE IS ON RIGHT ECAM DISPLAY (AS SOON AS ADVISORY IS CALLED UP).

2— OIL CLOG WARNING LIGHT (AMBER)
COMES ON IF OIL FILTER DIFFERENTIAL PRESSURE EXCEEDS 50 PSI
ACCOMPANIED BY AMBER LIGHT ON MASTER CAUTION AND SINGLE STROKE CHIME.
ENGINE PAGE APPEARS ON RIGHT ECAM DISPLAY.

BM5 79 00 00 0 KLMO 19

OIL LO Press Warning Light
Figure 007



1 – OIL PRESSURE
– FLASHES (G) WHEN 70PSI < P ≤ 75 PSI
– (R) WHEN P ≤ 70PSI

2 – OIL TEMPERATURE
– FLASHES (G) WHEN 163°C ≤ T ≤ 177°C
– (A) WHEN T ≥ 177°C OR MORE THAN 20 MN ABOVE 163°C

3 – NACELLE TEMPERATURE (G)
FLASHES WHEN ≥ 200°C

4 – OIL QUANTITY (G)
FLASHES WHEN QUANTITY ≤ 4 QTS

5 – FUEL PRESSURE
NO ADVISORY

6 – OIL ΔT (G)
FLASHES WHEN ΔT ≥ 44°C

BM5 79 00 00 0 KNMO - 19

ENGINE Page - Right ECAM Display Unit
Figure 008

1. Specified Fits and Clearances

A. General

(1)Reference numbers on figures indicate location of parts for which fits and clearances are specified.
Description of, and limits for, these fits and clearances are located in tables of corresponding reference numbers.
(2)Unless otherwise specified, all fits are diametral.
(3)Numbers in all columns shall be interpreted in inches and (millimeters).
(4)Letter "T" following limits indicates tight fit.
(5)Description column provides nomenclature for part or parts concerned.

B. Inspection Frequency Requirements

(1)IFR column provides Inspection Frequency Requirements.
Letter Codes A, B or C located in IFR column indicate manner and frequency of inspection recommended for item identified by adjacent reference number, as applicable to normal or routine repair.
Definitions for these codes are as follows :

IFR Code	Definition
A	Clearance or fit must be calculated from part measurements at each installation of parts. Part measurements taken and recorded at time of individual part inspection are considered equally as valid as measurements taken at time of part installation.
B	Clearance or fit must be estimated at each installation of parts. Use trial assembly or similar means to estimate clearance or fit. Measurement of parts and calculation of actual fit or clearance is required only if : - Estimating procedure indicates that clearance or fit is outside specified tolerance, or - Either or both mating parts involved have been replaced or repaired in an area or way which would affect the clearance or fit.
C	Fit not subject to change in normal engine operation. Measurement of parts and calculation of fit is required only if either of mating parts involved has been replaced or repaired in an area or way which would affect fit.

C. New Part Reference Dimensions
(1)Dimensions are provided in this column for reference only.
(2)Dimensions are the Minimum and Maximum manufacturing values in inches (and millimeters) for each part listed in the description column.

D. Limits
(1)Limits applicable to any combination of new or used parts.
(a)This column provides the acceptable (minimum - maximum) range of fit or clearance in inches (and millimeters). These limits may be applied to any combination of new or used parts.
(b)The limits are based on the mathematical combination of the minimum and maximum values specified in the New Part Reference Dimensions column. See example 1.
(c)Limits which have been expanded to be less restrictive than new part conditions are identified with an asterisk (*) adjacent to the value. See example 2.

EXAMPLE 1 :

Ref. No.	I F R	Description	New Part Reference Dimensions Min - Max	Limits Min - Max
1812		Bearing --------	0.508 (12.903) - 0.512 (13.005)	
		Support --------	0.517 (13.131) - 0.527 (13.385)	0.005 (0.126) - 0.019 (0.482)

NOTE : In example 1 limits are determined by comparing bearing and support referenced dimensions as follows :

0.517 (13.131) (-) 0.512 (13.005) = 0.005 (0.126)

0.527 (13.385) (-) 0.508 (12.903) = 0.019 (0.482)

EXAMPLE 2 :

Ref. No.	I F R	Description	New Part Reference Dimensions Min - Max	Limits Min - Max
1812		Bearing --------	0.508 (12.903) - 0.512 (13.005)	
		Support --------	0.517 (13.131) - 0.527 (13.385)	0.005 (0.126) - 0.020* (0.508)*

NOTE : In example 2 limits represent less restrictive values as indicated by the asterisk (*).

(2)Limits for selective application to engines scheduled for partial refurbishment.

(a)A second set of limits enclosed by brackets and lines may be provided. See example 3. These enclosed limits are less restrictive and are intended to be selectively applied to engines scheduled for partial refurbishment.

EXAMPLE 3 :

Ref. No.	I F R	Description	New Part Reference Dimensions Min	-	Max	Limits Min	-	Max
1812		Bearing --------	0.508 (12.903)		0.512 (13.005)			
		Support --------	0.517 (13.131)		0.527 (13.385)	0.005 (0.126)		0.019 (0.482)
						0.005 (0.13)		0.022 (0.56)

NOTE : In example 3 the enclosed (less restrictive) limits are intended for selective application, see text.

E. Fits and Clearances (Ref. Fig. 601, 602)

Ref. No.	I F R	Description	New Part Reference Dimensions Min	-	Max	Limits Min	-	Max
540	B	Lubrication and scavenge pump gearbox housing assembly (See Figure 601)						
		Pump --------	3.482 (88.443)		3.484 (88.493)			
		Housing --------	3.4865 (88.558)		3.4875 (88.582)	0.0025 (0.064)		0.0055 (0.139)
622	B	Pin Oil cooler front bracket bearing (See Figure 602)						
		Pin --------	0.6245 (15.8623)		0.6250 (15.8750)			

Ref. No.	IFR	Description	New Part Reference Dimensions Min - Max	Limits Min - Max
540	B	Lubrication and Bearing --------	0.6255 (15.888) - 0.6265 (15.913)	0.0005 (0.013) - 0.002 (0.050)

F. Special Torques

Ref. No.	Designation
2154	Electrical Harness Connector (Ref. 79-21-05, P. Block 401)
2151	Hose/Tube Clamp Screws (Ref. 79-11-00, P. Block 401)

2. Engine Oil System External Part Examination

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
Referenced Procedures :	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up

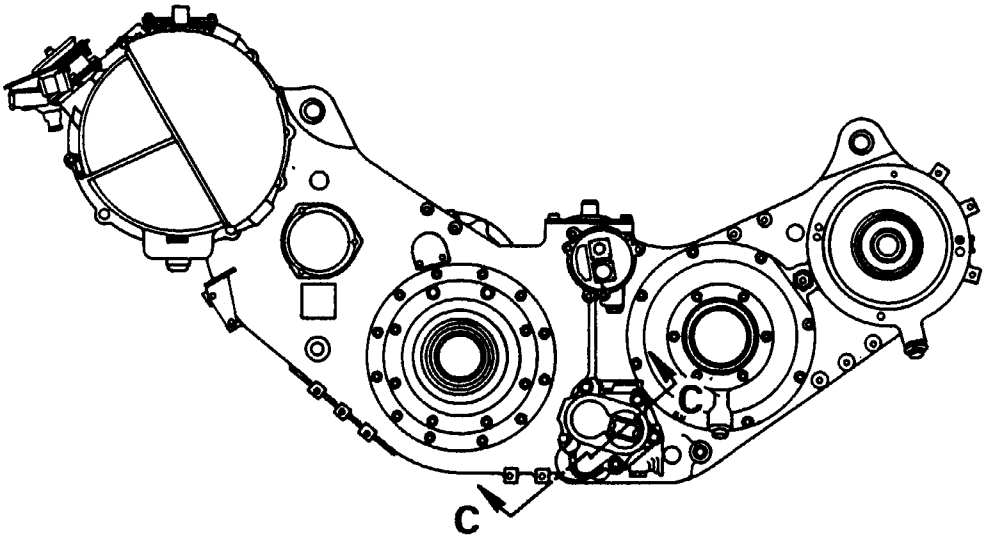
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure

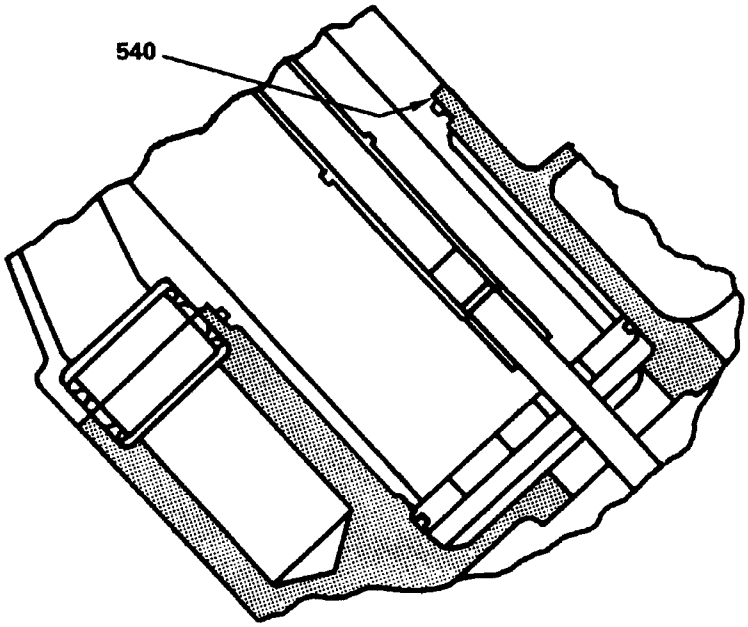
(1)Visually examine the external oil system tubes for damage. See Table 601.

NOTE : This inspection procedure does not require tube removal in order to inspect and verify acceptable tube condition. Oil system tube dents are to be considered acceptable for continued service if, visually, the tube OD is seen to not be decreased by more than 20 percent at any particular location.

The following Inspection Reference Table 601 is intended to serve as an aid for identifying certain areas and conditions



REAR VIEW

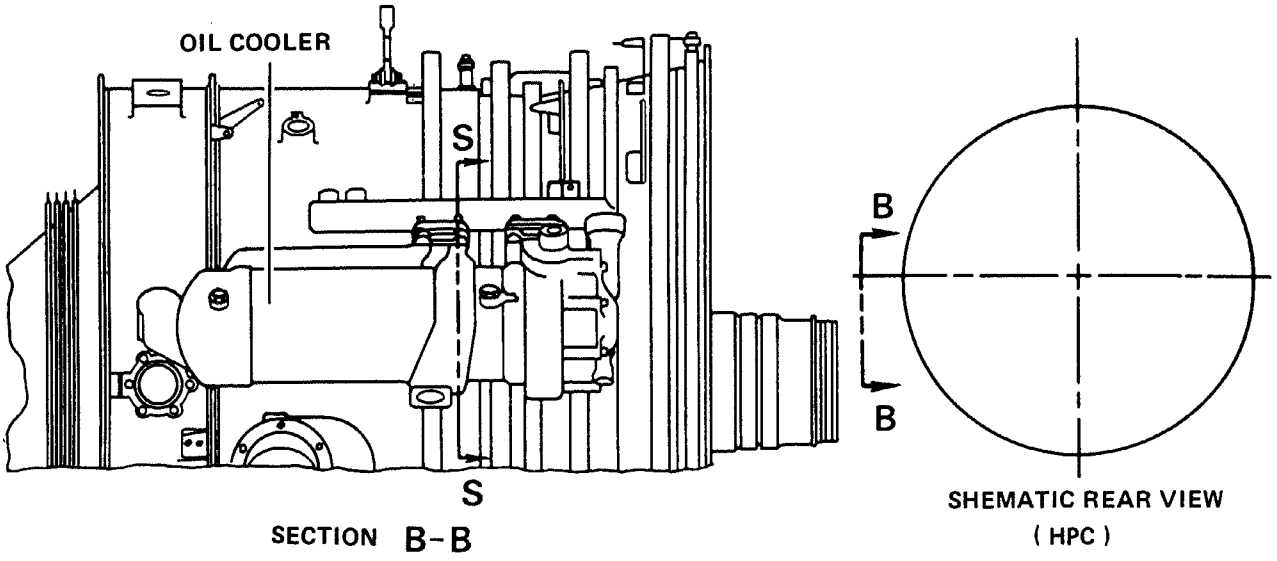


SECTION C-C

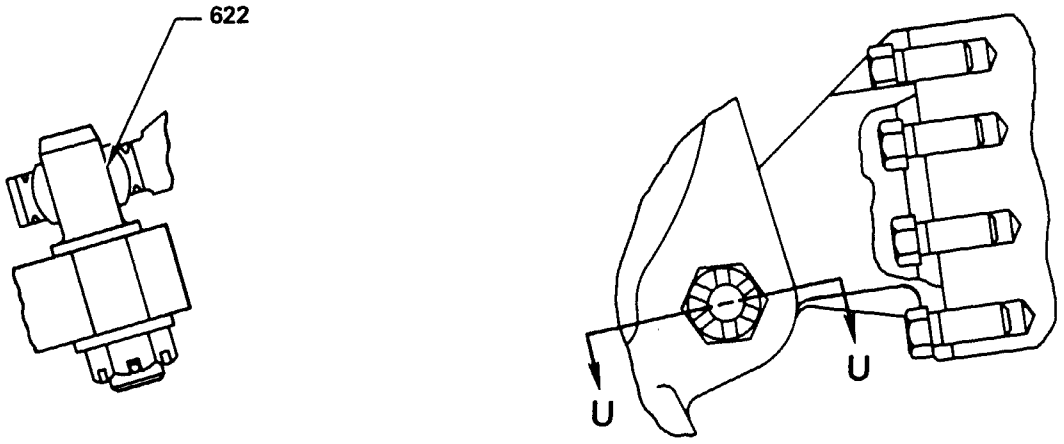
L-A3314 (1291)

BM5 79 00 00 6 KAMO - 00

Main Gearbox
Figure 601



L-A3312



L-A3313

BM5 79 00 00 6 KCMO - 23

High Pressure Compressor (HPC)
Figure 602

whenever maintenance time permits inspection. Tube inspection should not be accomplished solely on the basis of this table. Table 601 does not imply that items or conditions listed are all-inclusive. Experience and judgement will continue to be an important part of any inspection program.

ITEM	INSPECT FOR	CONTINUE IN SERVICE LIMITS
Oil System Tubes	Cracks	None Permitted
	Corrosion and Stains	Permitted if it can be removed by light polishing with crocus cloth
	Loose Tube Nuts	None Permitted
	Loose or Broken Lockwire	None Permitted
	Nicks, Scratches, Chafing and Pitting	0.003 in. (0.076 mm) maximum depth permitted in all locations
	Dents (without sharp edges or corners)	Permitted if the tubing OD is not decreased by more than 20 % at each location. No dents permitted within 0.25 in. (6.25 mm) or less from the tube ferrule.
	Dents (with sharp edges or corners)	None Permitted

Table 601 - Inspection Reference Table.
Continue in Service Limits For the Oil System Tubes.

(2)Visually examine the external oil system tubes for 0.125 in. (3.175 mm) minimum clearance to adjacent tubes or structure.
(a)Minimum clearance between any two adjacent tubes or between one single tube and any other adjacent engine part shall be 0.125 in. (3.175 mm) unless otherwise specified. Exceptions to this clearance requirement are permitted at specific locations where adjacent tubes are clipped together or where other local constraints will prevent tube contact at clearances below 0.125 in. (3.175 mm) minimum.
(b)Minimum clearance refers only to clearance relative to tube and not to fittings or other attached hardware.
(3)Examine the tubes to make sure they are correctly attached at all support locations.

(a)Replace all worn clamps.
(b)Tighten all loose clamp bolts and brackets at all support points along the tube length.
(c)Tighten all loose tube fittings.
(4)Examine the oil system tube connections, tube or manifold to component connections, and tube to case boss connections for leaks and loose connections.
(a)No leaks or loose connections permitted.
(b)Make all corrections as necessary.

D. Close-up
(1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove safety clips and tags and close circuit breakers.
(3)If applicable, test engine per Test Reference Table.
(Ref. 71-00-00, P. Block 501).

3. Visually Examine the Oil System for Leaks

A. General
R (1)Use this procedure to find leaks in the oil system with a blue dye
R that is applied to the engine oil before the test. Use of blue dye is
R optional for detection of leaks. After this test, the oil with the
R dye must be drained from the engine. This will enable a distinction
R between a nuisance leak from engine assembly (oil weeping from seams)
R and a true leak from the engine's lube system.

B. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
R B. Material No.P05-459	Special Materials (Ref. 70-00-00)
Referenced Procedures	
- 12-13-79, P. Block 1	Engines
- 71-00-00, P. Block 201	Power Plant - General
R	
- 71-13-00, P. Block 301	Cowl Doors
- 71-70-00, P. Block 1	Engine Drains
R - 72-00-00, P. Block 601	Engine - General
R - 79-11-02, P. Block 401	Oil Tank Cap
- 79-21-03, P. Block 401	Oil Filter
- 79-22-03, P. Block 401	Magnetic Plug (Chip Collector)

C. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

D. Prepare the Oil System for the Leak Test
WARNING : DO NOT LOOSEN THE OIL TANK CAP UNTIL FIVE MINUTES MINIMUM AFTER ENGINE SHUTDOWN (THIS WILL LET THE PRESSURE IN THE OIL TANK BECOME LOWER). HOT OIL CAN FLOW FROM THE OIL TANK AND

CAUSE BURNS IF THE TANK PRESSURE IS NOT RELEASED.

R (1)Drain the oil system completely using the existing procedures.
R (2)Add the blue dye solution in the oil system at the engine oil tank to
R refill the system using the existing procedures. (Ref. 79-11-02,
R P. Block 401) for the removal and installation of the oil tank cap.
R (3)Clean all the remaining oil from the engine external surfaces, tubes,
R components and accessories. Use SPOP 1 or SPOP 208.

E. Test Procedure (Idle Only)
(1)Start the engine. (Ref. 71-00-00, P. Block 201) "Engine Starting Procedures (Normal)."
(2)Let the engine become stable for five minutes at MINIMUM IDLE.
(3)Make sure all the engine parameters are in the permitted limits. The oil temperature must be at the operating limits. (Ref. 71-00-00, P. Block 201). "Engine Operating Limits."
(4)Do an engine shutdown. (Ref. 71-00-00, P. Block 201), "Engine Shutdown Procedure," (Normal).

F. Procedure After Idle Testing
(1)Do a visual inspection of the engine for oil leaks. The leak
R location will be identified by blue fluid at the tube joints or component (Ref. 72-00-00, P. Block 601).
R NOTE : Amber colour leaks are the result of assembly fluids.
R Blue colour leaks are the result of engine oil.
R (2)Do a check of the seal drains for signs of the blue fluid. (Ref. 71-70-00, P. Block 1) for locations of the drains.
(3)If necessary, repair the joints or components with leaks. After all
R the leaks are repaired, clean the dye by SPOP 1 or SPOP 208 and then do a check of the oil system again for leaks.
NOTE : It is possible that more running time is necessary at high power to get wetting of the leak area. Running time should be kept to a minimum to prevent too much leakage.
If a satisfactory leak check is done, go to step K. Procedure After All Leaks Are Repaired.

G. Optional Test Procedure (1.3 EPR power)
NOTE : This test is not necessary if you find all the leaks by the first test, (Idle only) procedure.
(1)Start the engine. (Ref. 71-00-00, P. Block 201), "Engine Starting Procedures (Normal)".
(2)Let the engine become stable for five minutes at MINIMUM IDLE.
(3)Make sure all the engine parameters are in the permitted limits. The oil temperature must be at the operating limits. (Ref. 71-00-00, P. Block 201), "Engine Operating Limits".
(4)Operate the engine at 1.3 EPR power for one minute.
(5)Do an engine shutdown. (Ref. 71-00-00, P. Block 201), "Engine Shutdown Procedure", (Normal).

H. Procedure After Optional Testing (at 1.3 EPR power)
(1)Do a visual inspection of the engine for oil leaks. The leak location
R will be identified by blue fluid at the tube joints or component.

(Ref. 72-00-00, P. Block 601).

R NOTE : Amber colour leaks are the result of assembly fluids.
R Blue colour leaks are the result of engine oil.

R (2)Do a check of the seal drains for signs of the blue fluid. (Ref. 71-70-00, P. Block 1), for locations of the drains.

(3)If necessary, repair the joints or components with leaks. After all the
R leaks are repaired, clean the dye by SPOP 1 or SPOP 208 and then do a check of the oil system again for leaks.

I. Optional Test Procedure (TAKE-OFF power)

NOTE : This test is not necessary if you find all the leaks by the other testing (Idle or 1.3 EPR) procedures.

(1)Start the engine. (Ref. 71-00-00, P. Block 201) "Engine Starting Procedures (Normal)".

(2)Let the engine become stable for five minutes at MINIMUM IDLE.

(3)Make sure all the engine parameters are in the permitted limits. The oil temperature must be at the operating limits (Ref. 71-00-00, P. Block 201) "Engine Operating Limits".

(4)Operate the engine at TAKE-OFF power for one minute.

(5)Reduce the engine power to 1.3 EPR. Stay at this power for 2 - 3 minutes.

(6)Do an engine shutdown. (Ref. 71-00-00, P. Block 201) "Engine Shutdown Procedure", (Normal).

J. Procedure After Optional Testing

(1)Do a visual inspection of the engine for oil leaks. The leak location
R will be identified by blue fluid at the tube joints or component. (Ref. 72-00-00, P. Block 601).

R NOTE : Amber colour leaks are the result of assembly fluids.
R Blue colour leaks are the result of engine oil.

R (2)Do a check of the seal drains for signs of the blue fluid. (Ref. 71-70-00, P. Block 1) for locations of the drains.

(3)If necessary, repair the joints or components with leaks. After all the
R leaks are repaired, clean the dye by SPOP 1 or SPOP 208 and then do a check of the oil system again for leaks.

K. Procedure After All Leaks Are Repaired

(1)After all the leaks are repaired, drain the dyed oil from the oil
R system. (Ref. 12-13-79, P. Block 1).

R (2)Remove the main oil filter element and replace with a new one.

R NOTE : Service the oil system before the engine is returned to service.

R (3)Fill the oil system with un-dyed oil. (Ref. 12-13-79, P. Block 1).

R (4)Start the engine. (Ref. 71-00-00, P. Block 201) "Engine Starting Procedures (Normal)".

R (5)Operate the engine for three minutes minimum time at MINIMUM IDLE.

R (6)Do an engine shutdown. (Ref. 71-00-00, P. Block 201) "Engine Shutdown Procedure", (Normal).

1. Cleaning Requirements After Chemical Contact With Oil

A. General

This procedure gives direction on how to clean the engine after chemical contact with oil.

B. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedure	
- 70-00-00, P. Block 201	Standard Practices

C. Procedure

(1) If necessary, clean the engine to remove oil by SPOP 425 (Ref. 70-00-00, P. Block 201).

OIL TANK - DESCRIPTION AND OPERATION

1. General

The oil tank is mounted to and partially incorporated in the main gearbox casting. It is located on the lower left side of the engine adjacent to the HPC rear case. All connections to the gearbox are internal to the gearbox casting. As swirl type deaerator is bolted into the tank.
Capacity of the tank as mounted on the engine with engine in a level upright position :

(1)Maximum oil capacity is 8.6 gallons (36.77 liter).
(2)Unusable oil - Extreme Nose Down Aircraft Attitude 9 quarts (9.51 liter).

The engine oil tank is sized to provide a minimum usable oil quantity based on 14 hours of engine operation.

2. Oil Tank Equipment (Ref. Fig. 001, 002)

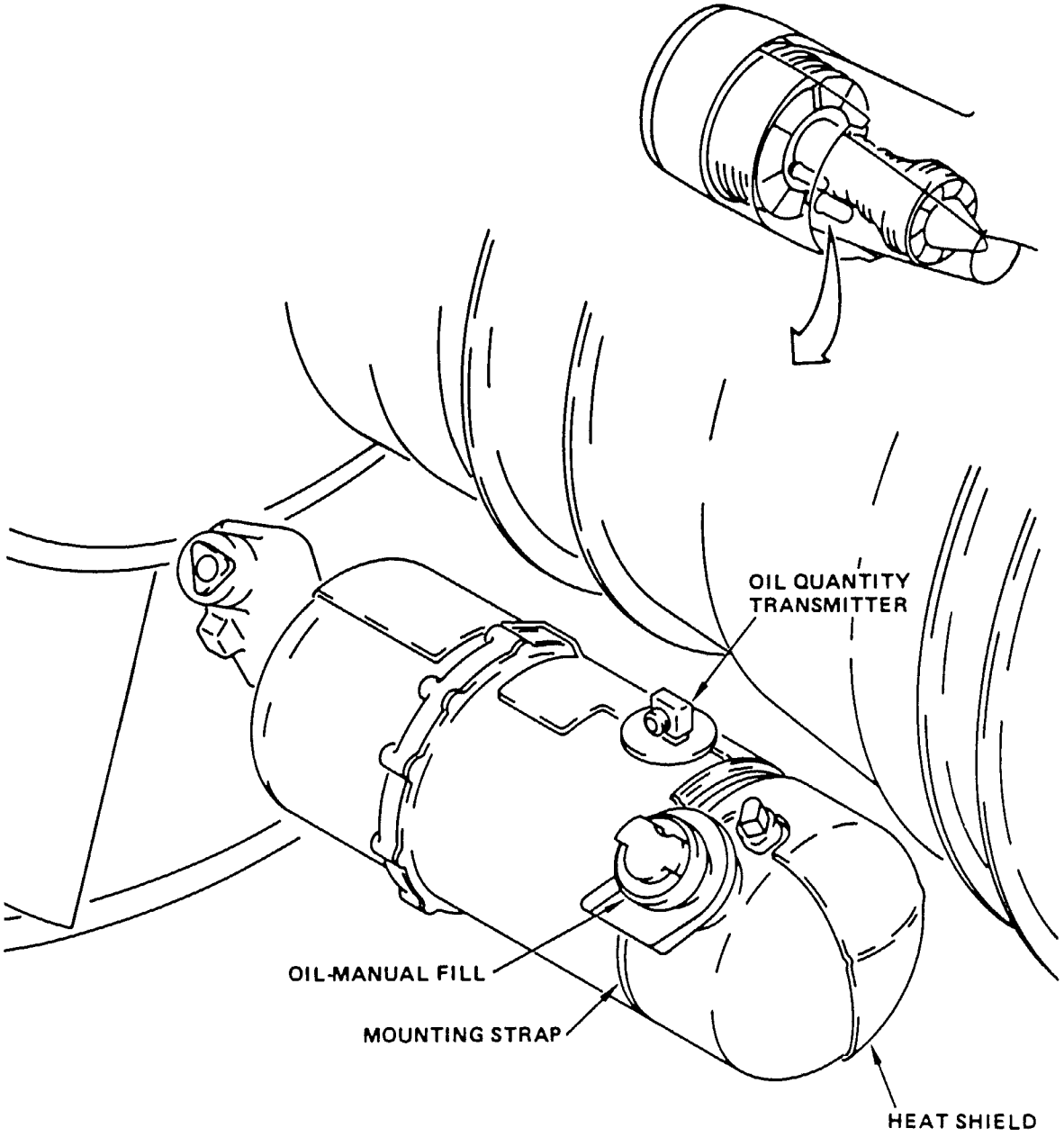
The oil tank contains the following features to determine oil level, and to service the tank :

(1)Gravity-fill port, including scupper drain.
(2)The remote service overflow port and remote fill fitting are optional equipment.
(3)Mounting boss for quantity transmitter probe.
(4)Oil level indicator (oil tank sight gage) (Ref. Fig. 003).
(5)Drain boss and plug.
(6)Oil tank cap (Ref. Fig. 004)

WARNING : A MINIMUM OF FIVE MINUTES SHOULD ELAPSE AFTER ENGINE SHUTDOWN TO ALLOW TANK PRESSURE TO BLEED OFF BEFORE OPENING AND REMOVING OIL TANK CAP. HOT OIL GUSHING FORM TANK COULD CAUSE SEVERE BURNS.

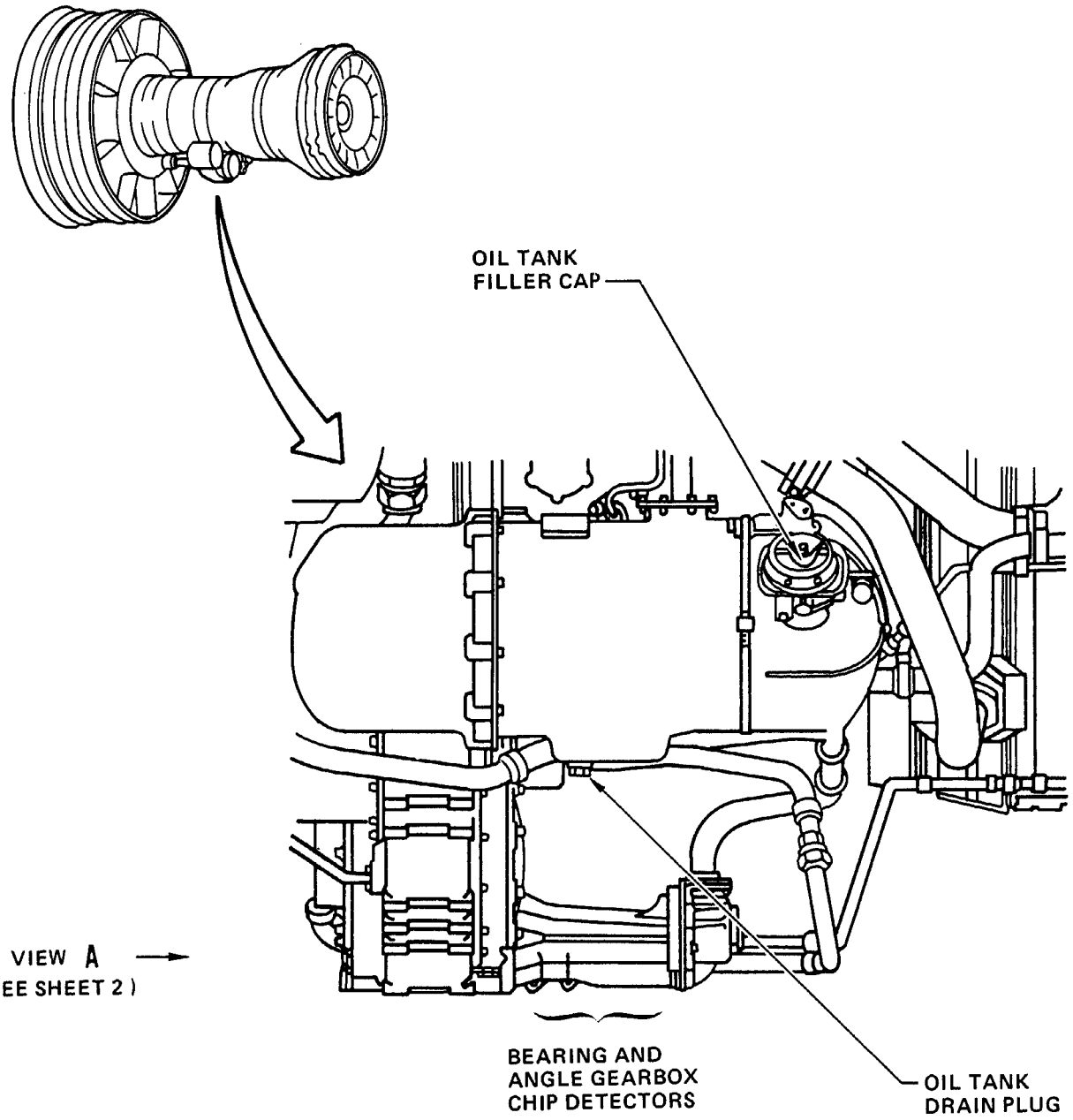
The oil tank cap is provided with a positive locking feature consisting of a spring loaded lock which is activated by turning handle 45 degrees clockwise to CLOSE position, and pressing down on handle. To release locking feature, lift handle and turn 45 degrees counterclokwise to OPEN position. (Ref. Fig. 001)

NOTE : The oil tank cap handle has a pointer that indicates if the cap is in the open or closed position.



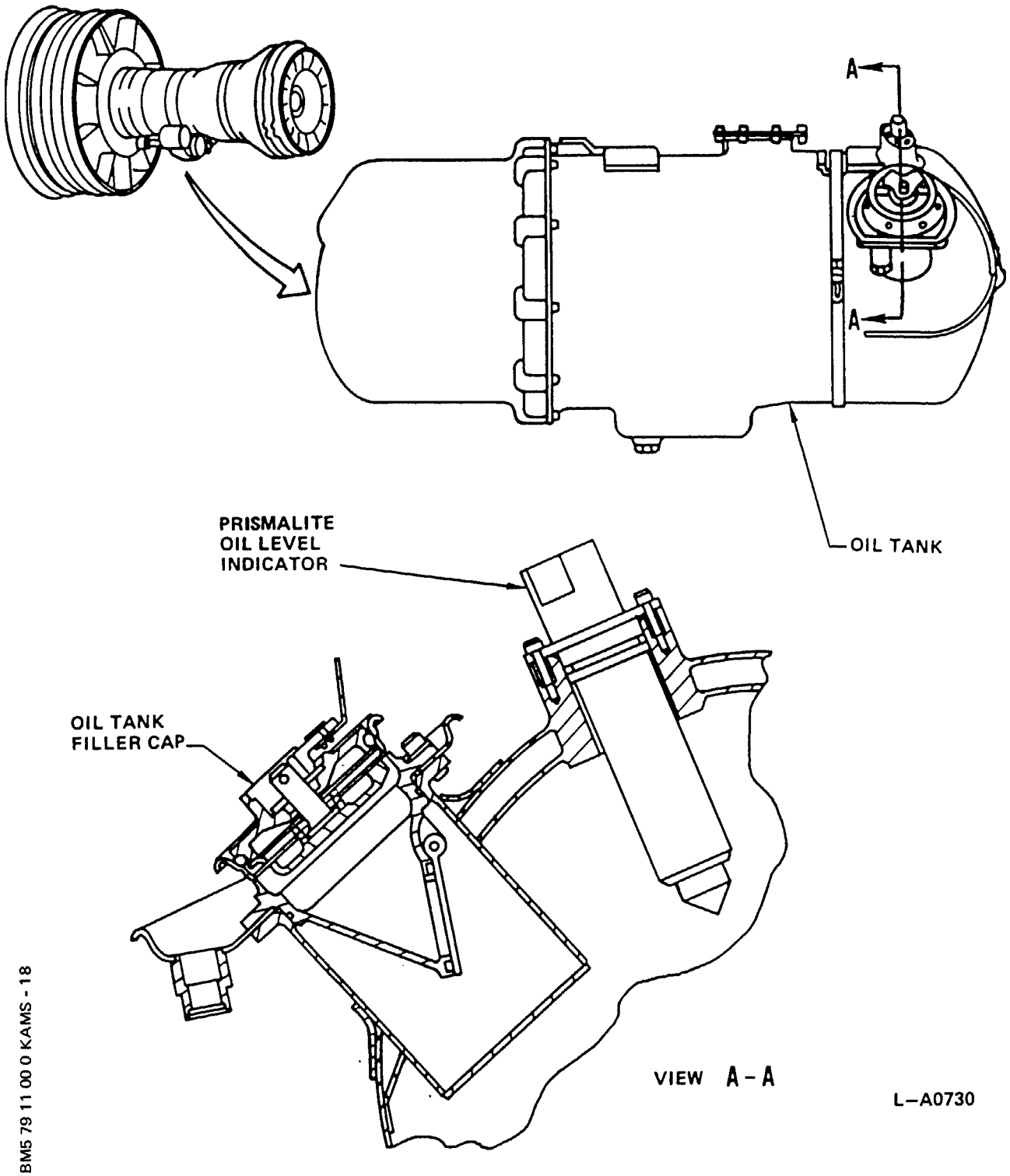
BM5 79 11 00 0 KAMA - 19

Oil Tank (Sheet 1/3)
Figure 001

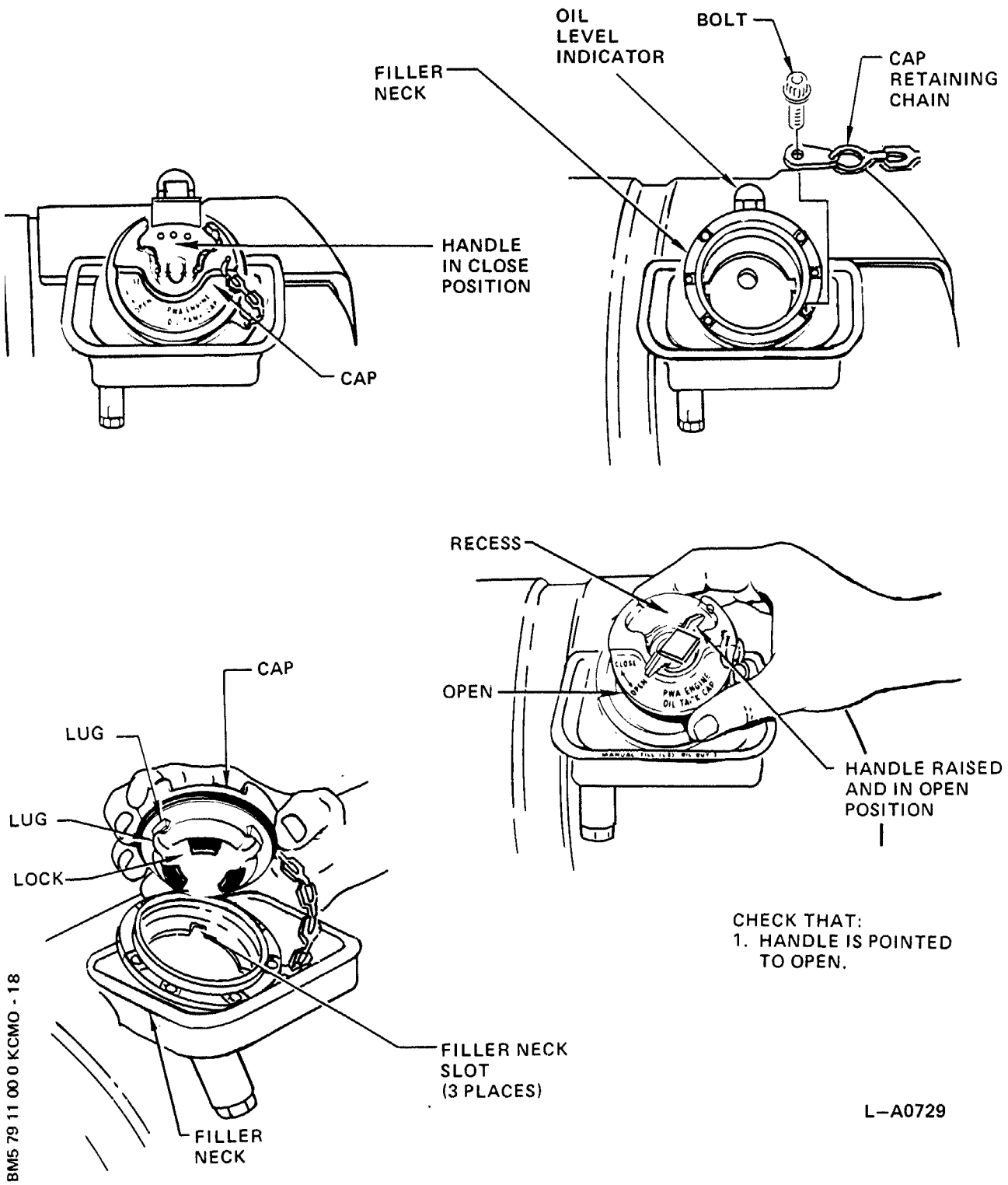


BM5 79 11 00 0 KAMJ - 18

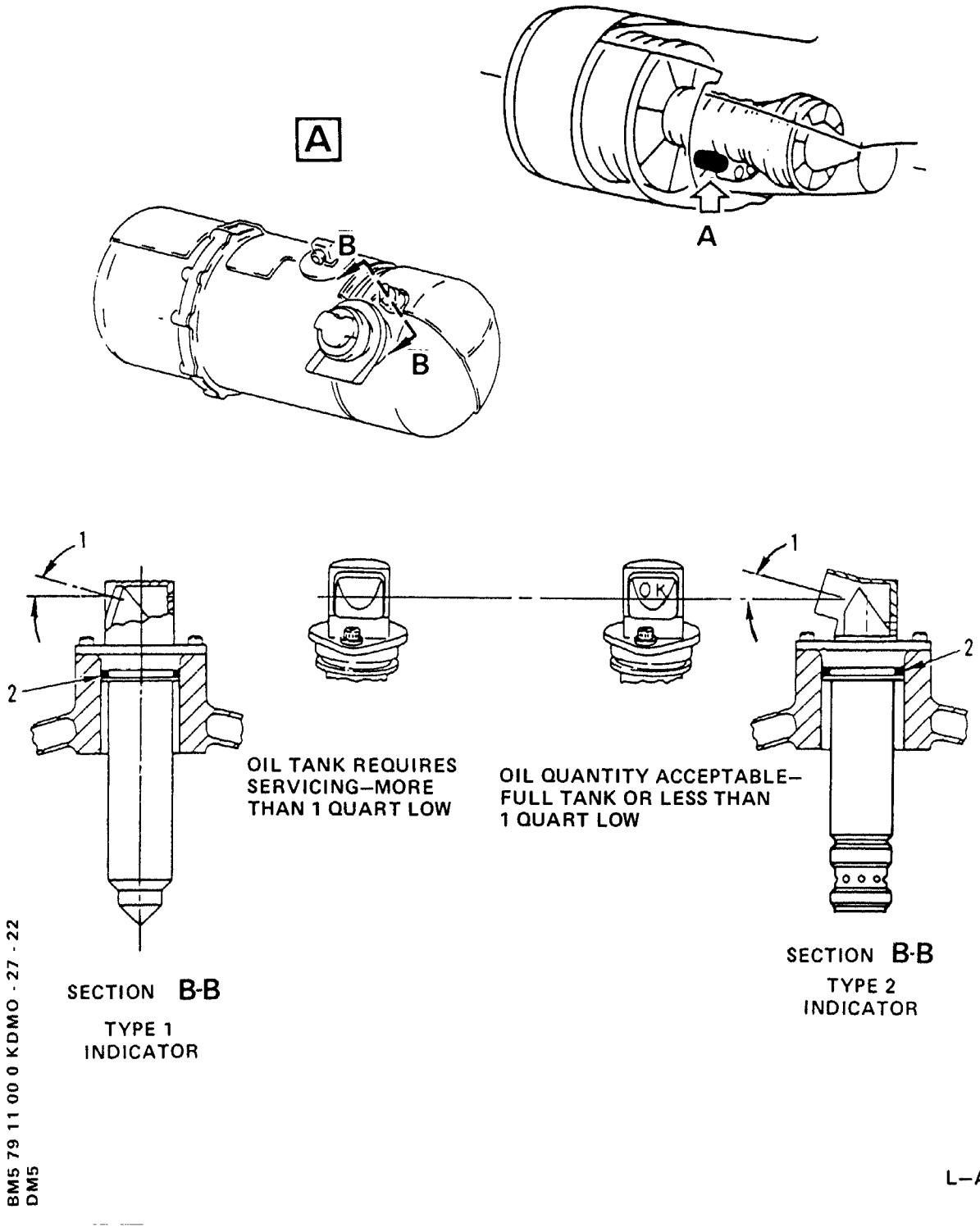
Oil Tank (Sheet 2/3)
Figure 001



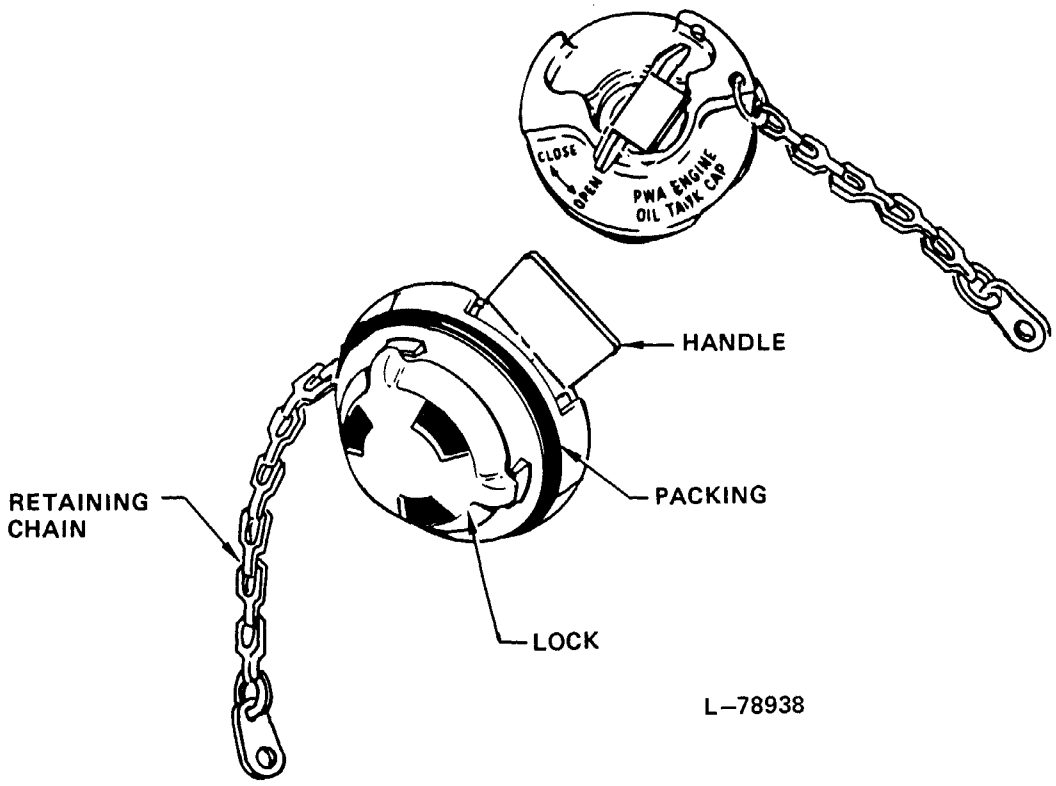
Oil Tank (Sheet 3/3)
Figure 001



Filter Cap Opening
Figure 002



Oil Tank Sight Gage
Figure 003



BM5 79 11 00 0 KEMO - 18

Oil Tank Cap
Figure 004

OIL TANK - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Packings
C.	Torque Wrench
D.	Protective Caps
E.	Container 10 US Gallons (38 l)
F.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
G. PWA88231	Puller, Jackscrew
H. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 75-24-03, P. Block 401	Turbine Blade and Vane Air Ducts
R - 79-22-03, P. Block 401	Magnetic Chip Collectors
- 79-31-01, P. Block 401	Oil Tank Sight Gage
- 79-31-11, P. Block 401	Oil Quantity Transmitter

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)Remove lower left turbine vane cooling air duct (Ref. 75-24-03, P. Block 401).

Pre SB PW4ENG 79-74

(3)Remove oil quantity transmitter (Ref. 79-31-11, P. Block 401).

End Pre SB PW4ENG 79-74

Post SB PW4ENG 79-74

(4)Remove oil quantity transmitter and heatshield bracket (Ref. 79-31-11, P. Block 401).

End SB PW4ENG 79-74

R (5)Remove the magnetic chip collector assembly from the oil tank (Ref. 79-22-03, P. Block 401).

(6)Remove the oil tank sight gage if it is necessary to use the sight gage from this oil tank on another oil tank (Ref. 79-31-01, P. Block 401).

B. Removal

WARNING : IN ORDER TO ALLOW TANK PRESSURE TO BLEED OFF, A MINIMUM OF FIVE MINUTES MUST ELAPSE AFTER ENGINE SHUTDOWN BEFORE LOOSENING OIL TANK CAP. HOT OIL GUSHING FROM TANK CAN CAUSE SEVERE BURNS.

(1)Loosen the oil tank cap (1) (Ref. Fig. 401).

(2)Remove pressure fill port and overfill port dust cover retainer from oil scupper drain tube assembly.

(3)Loosen union from coupling nut and remove packing from upper end of

scupper oil drain tube assembly. Discard packing.

(4)Loosen coupling nut on drain tube assembly from union at bracket beneath oil tank. Remove drain tube assembly.

(5)Loosen and remove union, washer, and nut from bracket beneath oil tank.

(6)Remove the oil tank from the gearbox. (Ref. Fig. 401)

(a)Remove the bolt (2) and engine ground-strap (4) from the oil tank. The ground-strap must stay with the engine.

(b)Remove the bolt (2) and bracket (5) that has the identification plate. The bracket must stay with the gearbox.

(c)Remove the bolt (2) and bracket (3) that hold the heat shield (1).

NOTE : The bracket is PRE SB PW4 ENG 79-48 only.

(d)Remove the remaining bolts that attach the oil tank to the gearbox.

CAUTION : TO PREVENT DAMAGE TO THE GEARBOX HOUSING, MAKE SURE ALL THE OIL TANK TO GEARBOX ATTACHMENT BOLTS ARE REMOVED BEFORE INSTALLING PWA88231 PULLER.

(e)Use a PWA88231 jackscrew puller to carefully remove oil tank from gearbox as follows :

1 Put upper clamp ring half and lower clamp ring half around oil tank between the bolt flange and the circumferential weld.

2 Attach two clamp ring halves to oil tank with two detail socket head cap screws.
Tighten two cap screws to pull upper and lower clamp ring halves together.

3 Install four detail jackscrews into internal thread holes of puller.

4 Tighten four jackscrews slowly and equally to disengage oil tank from gearbox.

5 Remove oil tank and puller from engine.

6 Remove puller from oil tank. Loosen and remove two detail socket head cap screws.
Remove upper and lower clamp ring halves from oil tank.

(f)Remove the oil tank.

(7)Remove and discard packings (2), (3), (4) and (5) (Ref. Fig. 402).

(8)If it is necessary to use the heatshield from this oil tank on another oil tank, remove the heatshield (Ref. Fig. 401)

(a)Remove the clamp (6).

(b)Remove the heat shield (1) and bracket (3).

NOTE : The bracket is PRE SB PW4 ENG 79-48 only.

(9)Remove the oil tank cap and related parts from this oil tank if it is necessary to use those parts on another oil tank. This procedure is for an oil tank that either has no remote filler or is post SB PW4 ENG 79-47 (Ref. Fig. 403).

(a)Remove the oil tank cap (1) :

1 Lift the handle. Turn the cap counterclockwise. Remove the cap.

2 Remove the lockwire and bolt (4) that hold the oil tank cap lanyard (3).

3 Discard the packing (2).

(b)Remove the filler neck valve (5) :

1 Remove the lockwire and remaining bolts (4).

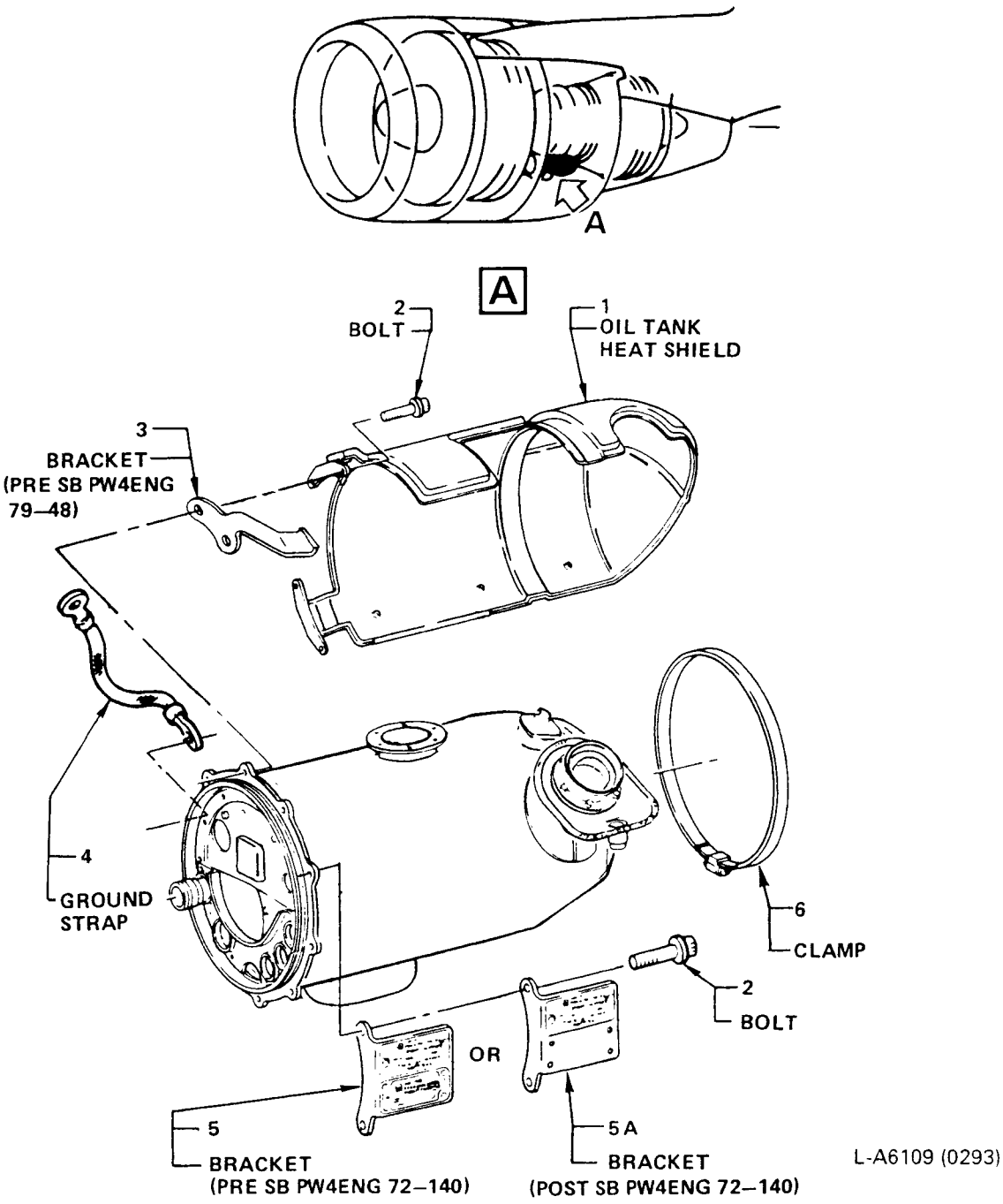
2 Remove the filler neek valve.

3 Discard the packing (6).

4 Examine the packing (8) under the valve. If the packing is cut or

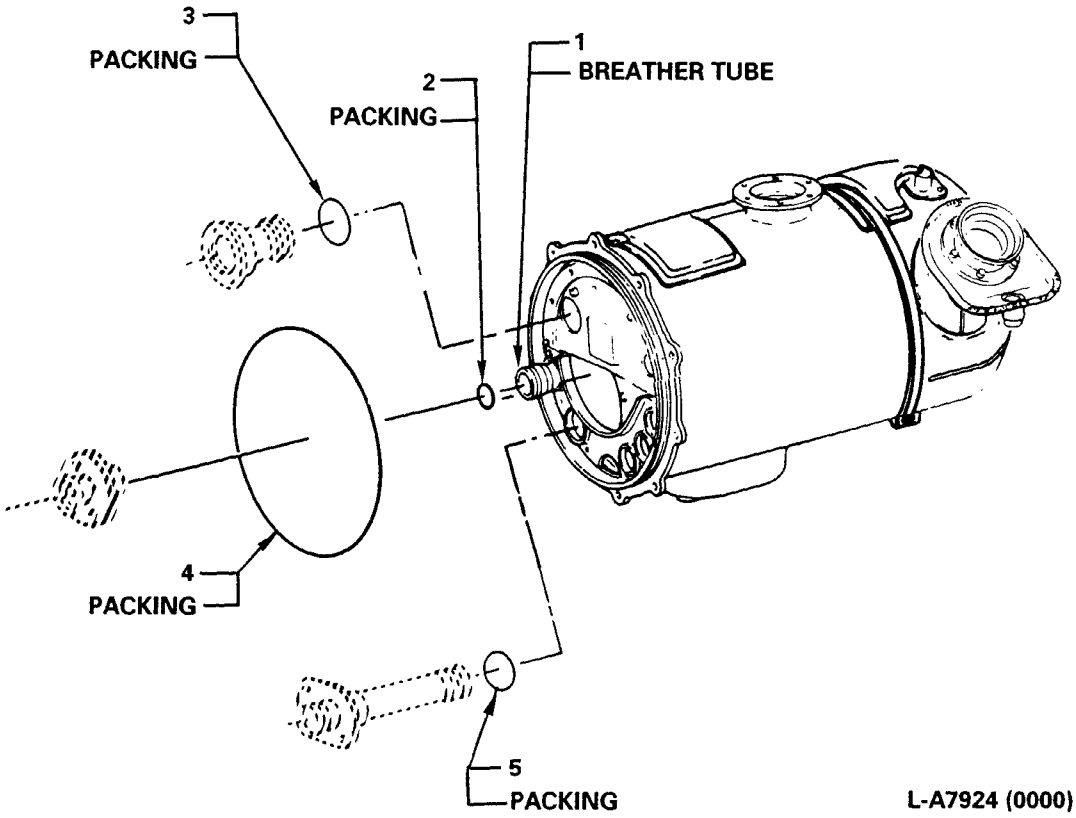
deteriorated, discard it.
(c)Remove the oil tank sump (7).
(10)Remove the oil tank cap and related parts from this oil tank if it is necessary to use those parts on another oil tank. This procedure is for an oil tank that has a remote filler and is pre SB PW4 ENG 79-47 (Ref. Fig. 404).
(a)Remove the oil tank cap (1) :
1 Lift the handle. Turn the cap counterclockwise. Remove the cap.
2 Remove the bolt (4) and nut (16) that hold the oil tank cap lanyard (5).
3 Discard the packing (2).
(b)Remove the filler neck valve (3) :
1 Remove the lockwire and the remaining bolts (4), (7) and nuts (16).
2 Remove the filler neck valve.
3 Discard the packing (6).
4 Examine the packing (17) under the valve. If the packing is cut or deteriorated, discard it.
(c)Remove the oil tank sump (8).
(d)Remove the connector (9) (remote filler) :
1 Remove the lockwire and bolts (12).
2 Remove the connector.
3 Discard the packing (13).
4 If applicable, remove the plugs (11), (15) and packings (10) and (14). Discard the packings.
(11)To protect the oil tank holes, install covers.

C. Installation
(1)If not installed, install oil tank cap (1) and related parts, either no remote filler or post SB PW4 ENG 79-47, as follows (Ref. Fig. 403).
(a)Align the oil tank sump (7) on the oil tank boss.
(b)Install the filler neck valve (5) :
1 Look under the valve of the filler neck valve. If there is no packing (8) there install one that is lubricated with Material No.P03-001.
2 Apply Material No.P03-001 to a packing (6) and the threads of six bolts (4).
3 Put one of the bolts in the hole of the oil tank cap lanyard (3).
4 Attach the filler neck valve and the oil tank sump to the oil tank with the six bolts. TORQUE the bolts to between 32 and 36 lbf.in. (0.361 and 0.406 m.daN). Wirelock.
(c)Install the oil tank cap (1) :
1 Apply Material No.P03-001 to a packing (2). Install the packing on the oil tank cap.
2 Put the cap in the filler neck valve. Turn the cap clockwise to CLOSE.
(2)If not installed, install the oil tank cap (1) and related parts, with a remote filler and pre SB PW4 ENG 79-47, as follows. (Ref. Fig. 404).
(a)Install the connector (remote filler) (9) :
1 Apply Material No.P03-001 to a packing (13) and the threads of four bolts (12).
2 Install the packing on the connector.
3 Attach the connector to the oil tank with the four bolts. TORQUE the bolts to between 32 and 36 lbf.in. (0.361 and 0.406 m.daN).



BM5 79 11 00 4 KAMO - 04

Oil Tank - Gearbox Connections
Figure 401



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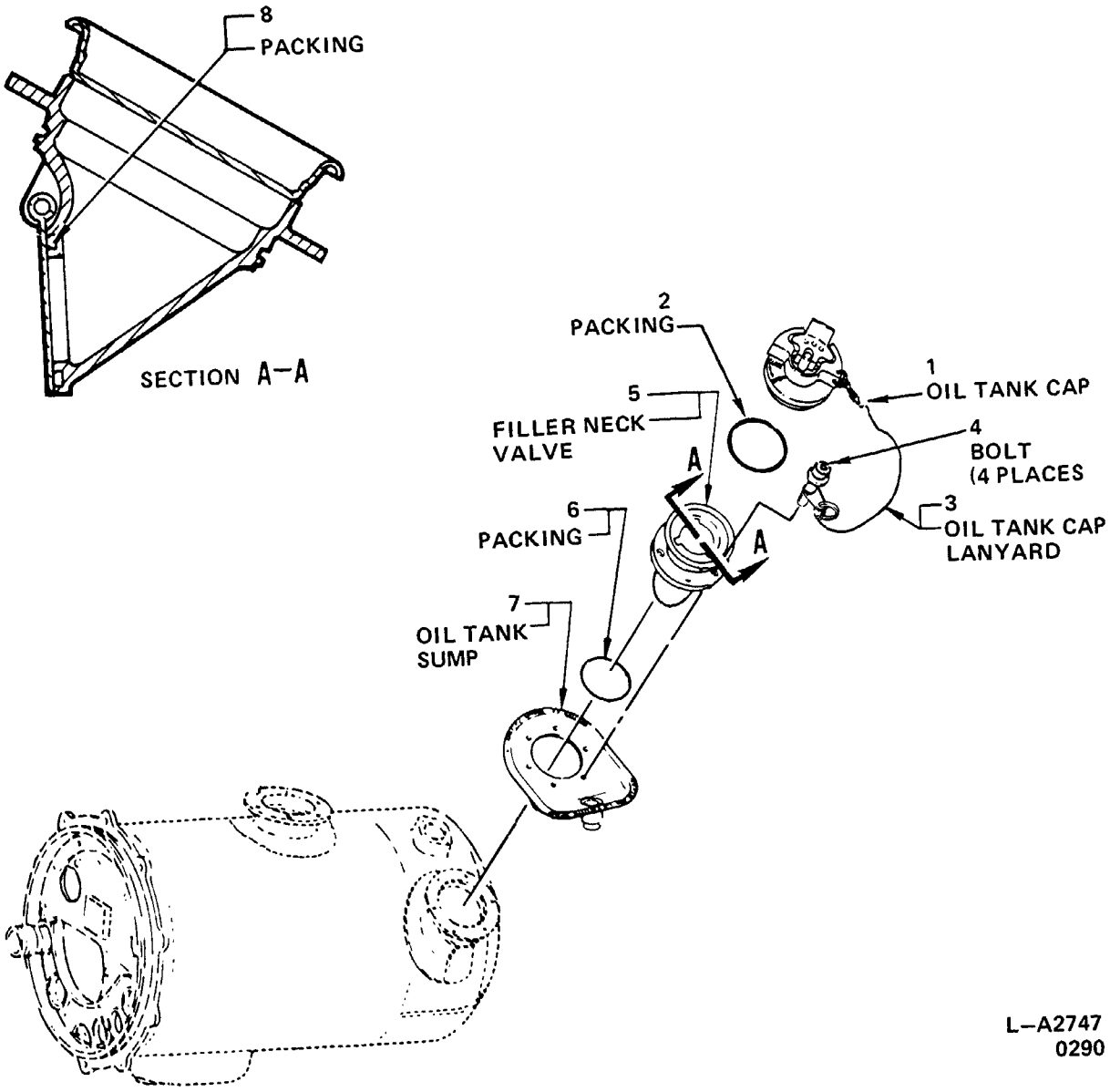
Oil Tank Packings
Figure 402



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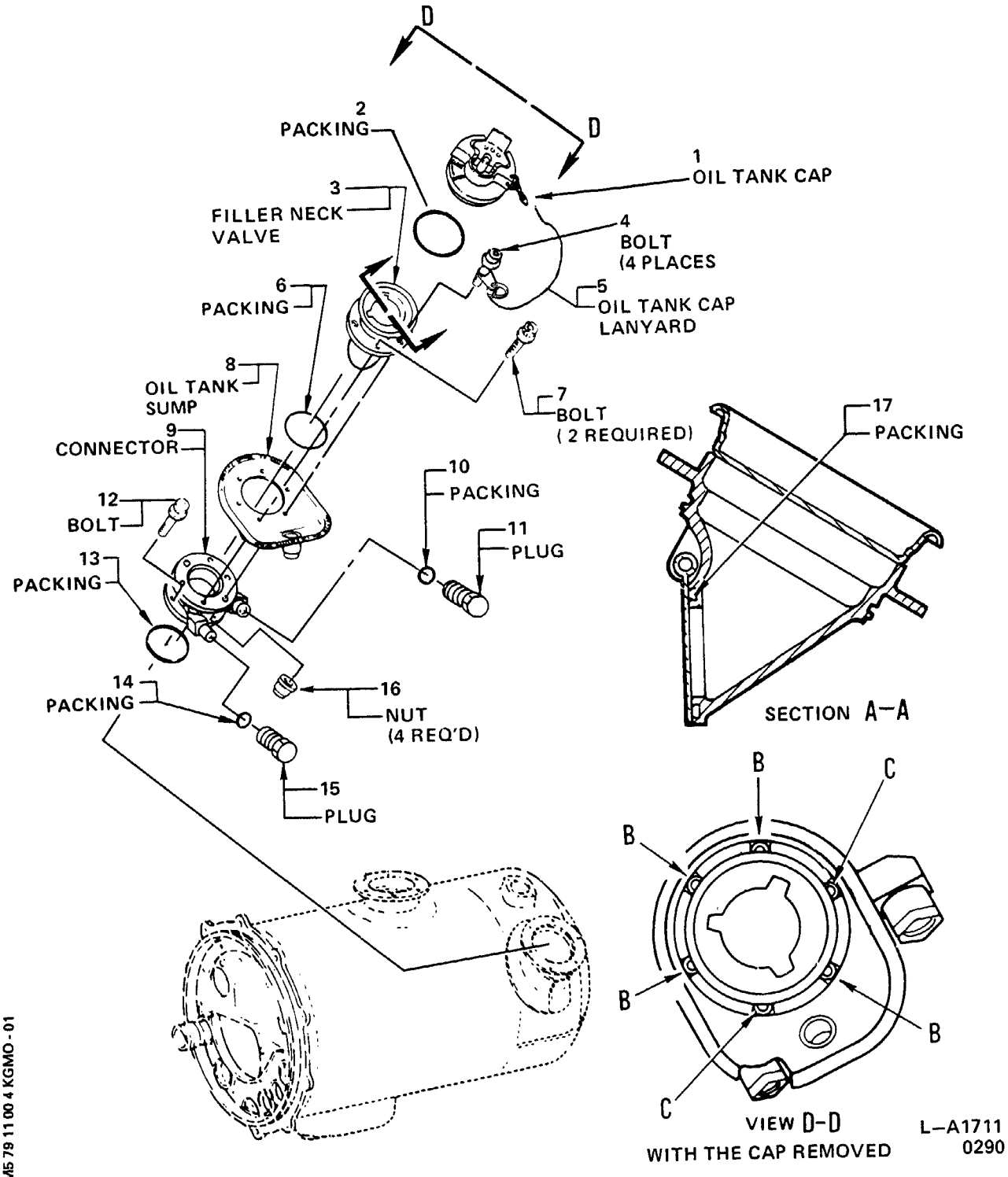
Oil Tank Cap and Related Parts
(No Remote Filler or Post SB PW4 ENG 79-47)
Figure 403



Oil Tank Cap and Related Parts
(With Remote Filler)
Figure 404

Wirelock.

4 If applicable, install the plugs (11) and (15) :
- Apply Material No.P03-001 to two packings (10) and (14) and the threads of the two plugs.
- Put the packings on the plugs.
- Install the plugs. TORQUE plug (11) to between 200 and 225 lbf.in. (2.259 and 2.542 m.daN) TORQUE plug (15) to between 110 and 120 lbf.in. (1.242 and 1.355 m.daN). Wirelock.

(b)Install the filler neck valve (3) :

1 Align the oil tank sump (8) on the connector.

2 Apply Material No.P03-001 to a packing (6) and the threads of two bolts (7) and four bolts (4).

3 Install the packing on the filler neck valve.

4 Put one of the bolts in the hole of the oil tank cap lanyard (5).

5 Attach the filler neck valve, oil tank sump, and connector to the oil tank with the two long bolts at location C.

6 Attach the filler neck valve and oil tank sump to the connector with the four short bolts and nuts (16) at location B.

7 TORQUE the short bolts to between 36 and 40 lbf.in. (0.406 and 0.451 m.daN).

8 TORQUE the long bolts to between 32 and 36 lbf.in. (0.361 and 0.406 m.daN).

(3)Install the oil tank heatshield as follows (Ref. Fig. 401).

(a)Align the raised seam of the heatshield (1) with the seam on the oil tank.

(b)Apply Material No.P03-001 to the clamp screw.

(c)Attach the heatshield with the clamp (6). TORQUE the clamp screw to between 15 and 18 lbf.in. (0.169 and 0.203 m.daN).

(4)Install the packings on the gearbox-oil tank mating parts. (Ref. Fig. 402).

(a)Apply Material No.P03-001 to packings (2), (3) (4) and (5).

(b)Install packing (4) on the front mating flange of the oil tank.

(c)Install packing (2) on the oil tank breather tube.

(d)Install packing (5) on the gearbox transfer tube.

(e)Install packing (3) on the gearbox oil check valve housing.

CAUTION : USE THE CORRECT PART NUMBER OIL TANK. INTERCHANGEABILITY IS AFFECTED. REFER TO SB PW4 ENG 79-43.

(5)Install the oil tank on the gearbox (Ref. Fig. 401).

(a)Apply Material No.P03-001 to the threads of bolts (2).

(b)Align the offset boltholes on the oil tank and gearbox.

(c)Attach the bracket (3), heat shield (1), and oil tank with five of the bolts.

NOTE : The bracket is PRE SB PW4 ENG 79-48 only.

(d)Attach the bracket (5) with the identification plate with two of the bolts.

(e)Attach the oil tank and ground-strap (4) to the gearbox at any position with one of the bolts.

(f)Install the remaining bolts. Tighten the bolts.

CAUTION : MAKE CERTAIN THAT THE TUBES IN THE OIL TANK CORRECTLY ENGAGE THE TUBES FROM THE GEARBOX. INCORRECT ENGAGEMENT OF THE TUBES CAN CAUSE AN IN-FLIGHT SHUTDOWN.

(g)Make certain that the oil tank is correctly installed as follows (Ref. Fig. 402).
1 Look in the hole at the top of the oil tank where the oil quantity transmitter attaches.
2 With a mirror, do a check to be sure that the tubes inside the oil tank are engaged with the tubes from the main gearbox. Give special attention to the engagement of the breather tube (1) with its mating tube.
(h)**TORQUE** the bolts to between 180 and 200 lbf.in. (2.04 and 2.25 m.daN).
(6)Install washer, nut, and union to bracket beneath oil tank. **TORQUE** nut to between 125 and 140 lbf.in.(1.42 and 1.58 m.daN).
(7)Install new packing and union to oil tank scupper. **TORQUE** union to between 125 and 140 lbf.in. (1.42 and 1.58 m.daN).
(8)Attach oil scupper drain tube assembly to upper union at oil tank scupper and to union in bracket beneath oil tank. **TORQUE** each coupling nut to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN).
(9)Attach pressure fill port and overfill port dust cover retainer to upper end of oil scupper drain tube assembly.

D. Close-Up
(1)Install the oil tank sight gage. (Ref. 79-31-01, P. Block 401).
R (2)Install the magnetic chip collector assembly in the oil tank. (Ref. 79-22-03, P. Block 401).
(3)Install lower left turbine vane cooling air duct (Ref. 75-24-03, P. Block 401).
Pre SB PW4ENG 79-74
(4)Install oil quantity transmitter (Ref. 79-31-11, P. Block 401).
End Pre SB PW4ENG 79-74
Post SB PW4ENG 79-74
(5)Install oil quantity transmitter and heatshield bracket (Ref. 79-31-11, P. Block 401).
End SB PW4ENG 79-74
(6)Service oil tank (Ref. 12-13-79, P. Block 1).
(7)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(8)Close thrust reverser and fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(9)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

OIL TANK CAP - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Packing
B. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-65-01, P. Block 601	Main Gearbox

2. Procedure

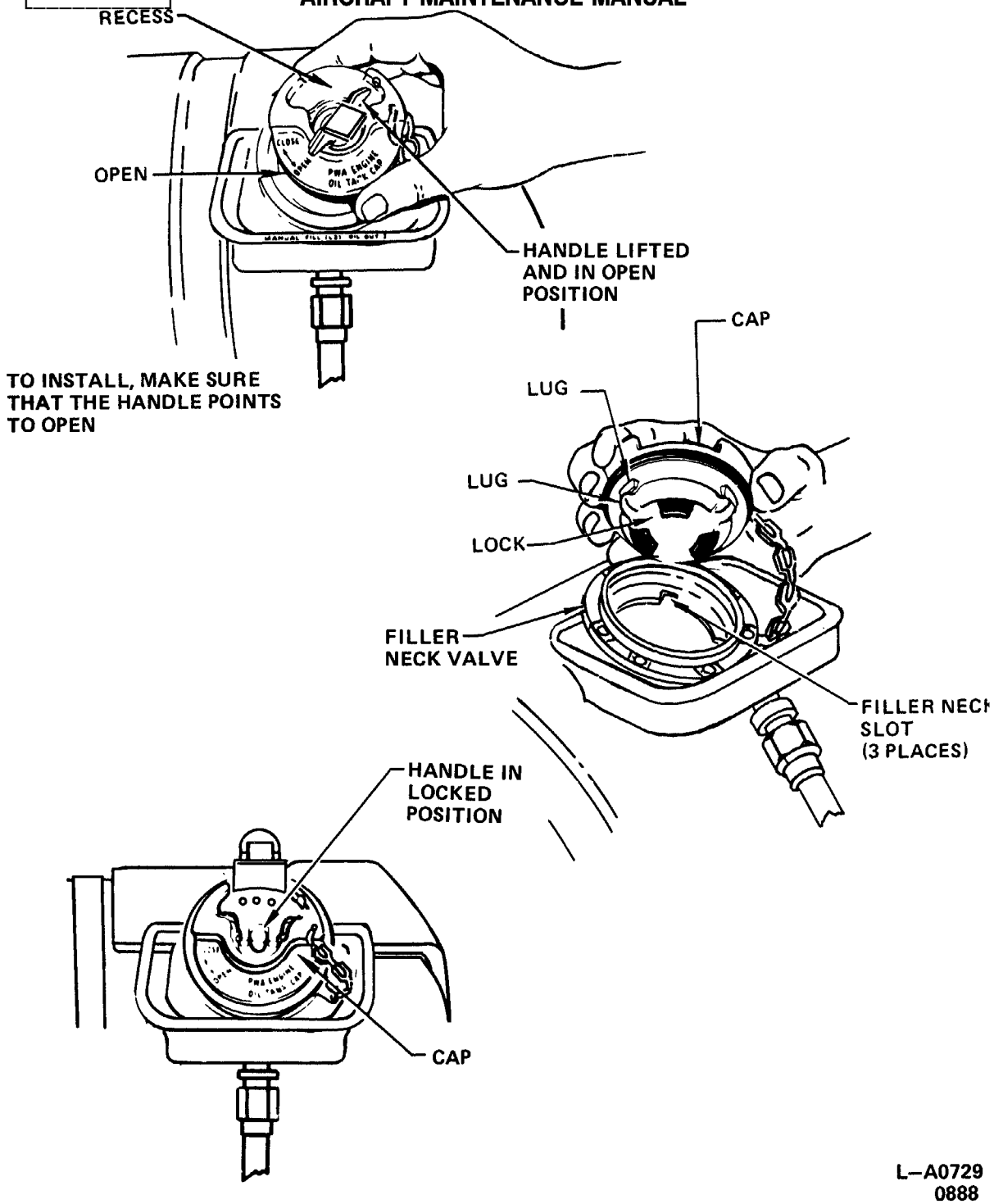
A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open left thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)
(1)Lift the handle of the cap.
(2)Turn the cap counterclockwise.
(3)Remove the cap. Examine the packing (7). If it is torn, cut, or shows deterioration, remove and discard it. (Ref. Fig. 402).
(4)If inspection (Ref. 72-65-01, P. Block 601) showed that the packing in the cap was defective, remove the packing as follows (Ref. Fig. 402).
(a)Remove the handle (2) as follows :
1 Push the cap (2) and lock (10) together.
2 While they are pushed together, remove the pin (3) with a drift.
3 Remove the handle (2).
(b)Slowly release the pressure on the cap and lock. The washer (4), cap (6), spring (9), plate (8), and lock (10) will move apart.
(c)Discard the packing (5).

C. Installation
(1)If the cap is disassembled, assemble the cap as follows : (Ref. Fig. 402)
(a)Apply Engine Oil (P03-001) to a new packing.
Install the packing in the packing groove in the lock (10).
(b)Assemble the lock (10), spring (9), plate (8), cap (6) and washer (4).
(c)Put the handle (2) in position on the shaft of the lock (10) and the cap (6). Press together the lock (10) and the cap (6).
While pressed together, put the pin (3) through the handle (2).
(2)Install the oil tank cap (Ref. Fig. 401)
(a)If not installed, install a new packing (7) (Ref. Fig. 402) lubricated with Material No.P03-001, in the packing groove on the cap.
(b)With the handle at OPEN, align the lugs of the cap with the slots of the filler neck valve.
(c)Install the cap.
(d)Push down on the cap while you turn the handle clockwise to CLOSE.
(e)Push the handle in the recess. This locks the cap.

(f) Make sure that the cap is locked.
1 Try to pull up on the edge of the cap.
2 With your hand, apply pressure to the outer edge of the cap at opposite points.
3 The cap must not move.
4 If necessary, remove the cap and repeat the procedure.

D. Close-Up
(1)Close left thrust reverser cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.



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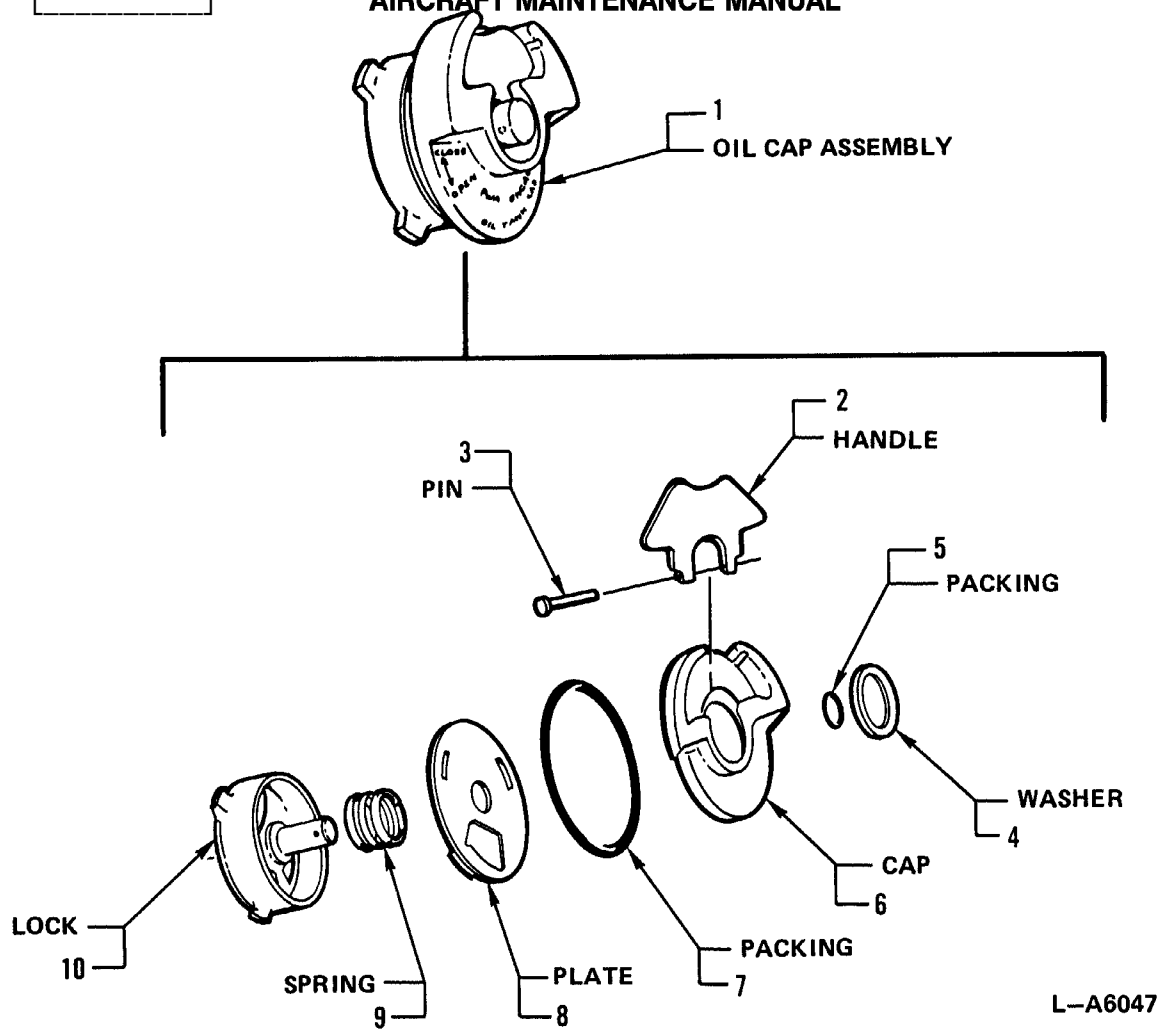
Remove the Oil Tank Cap
Figure 401



BM5 79 11 02 4 KCMO - 00

Disassemble the Oil Tank Cap
Figure 402

ENGINE OIL TANK PRESSURE FILL SYSTEM - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P03-001	Oils (Ref. 70-00-00)
C.	Packings
D.	Protective Covers
E.	Torque Wrench
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

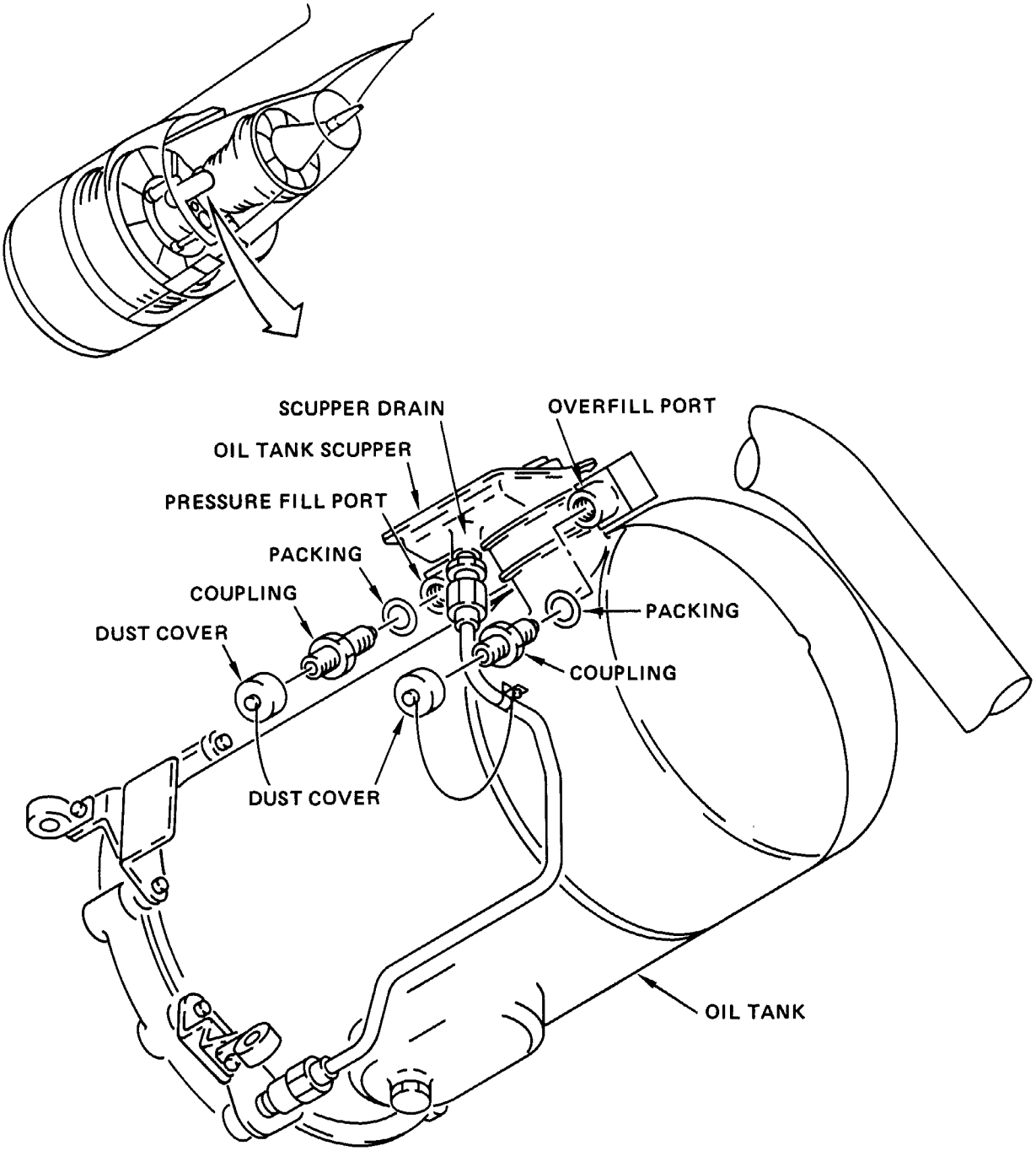
2. Procedure

A. Job Set-Up
(1) Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)
(1) Remove dust covers, pressure fill coupling, overfill coupling and packings from oil tank scupper ports. Discard packings and install protective covers on ports.

C. Installation (Ref. Fig. 401)
(1) Lubricate packing with Material No.P03-001, and install packing and coupling in oil tank scupper overfill port. TORQUE coupling to between 215 and 240 lbf. in. (2.42 and 2.71 m. daN.).
(2) Lubricate packing with Material No. P03-001, and install packing and coupling in oil tank scupper pressure fill port. TORQUE coupling to between 125 and 140 lbf. in (1.41 and 1.58 m. daN.).
(3) Install dust covers on couplings.

D. Close-Up
(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2) Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.



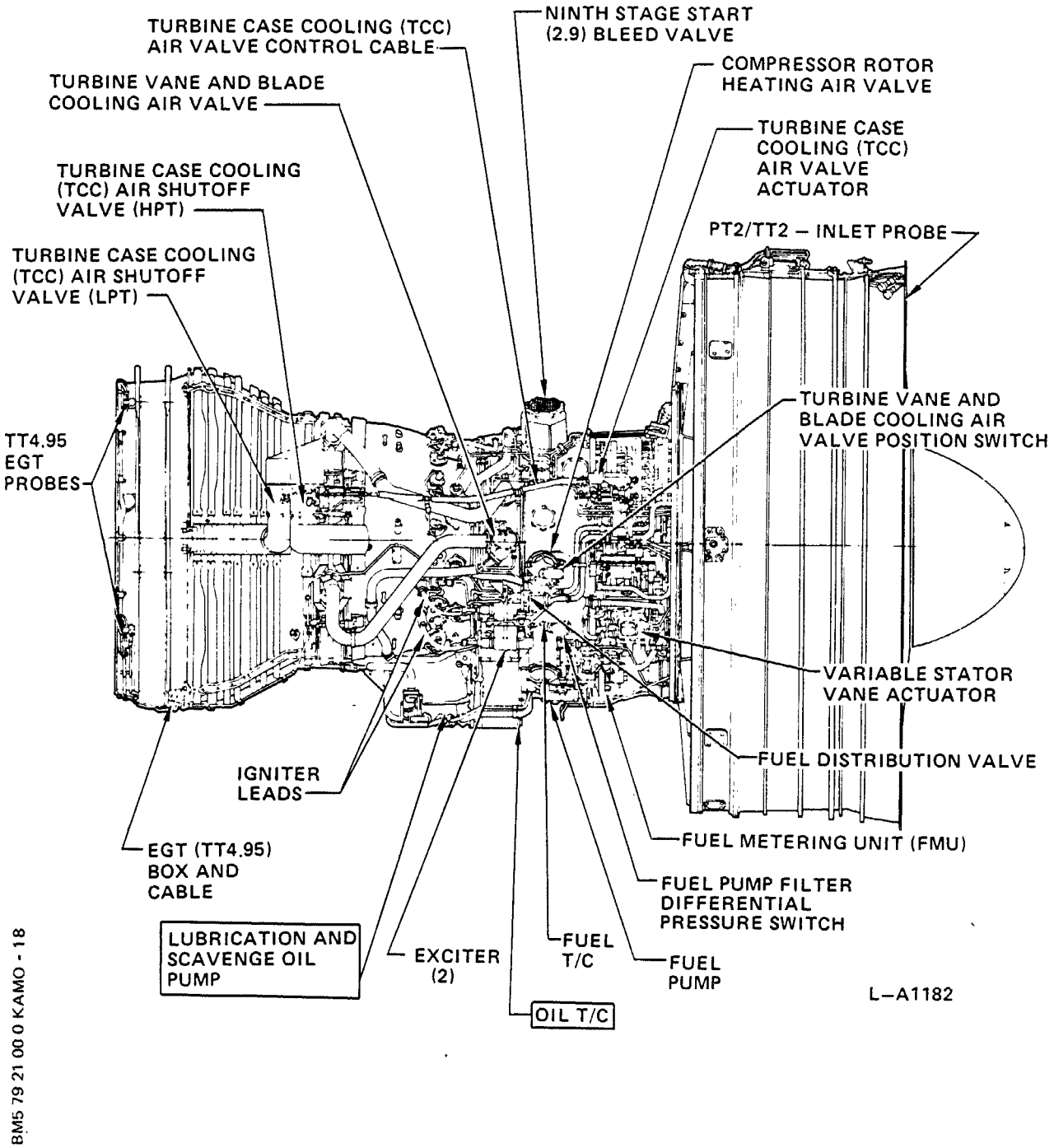
Engine Oil Tank Pressure Fill System
Figure 401

1. General (Ref. Fig. 001, 002, 003)
(Ref. Fig. 004)

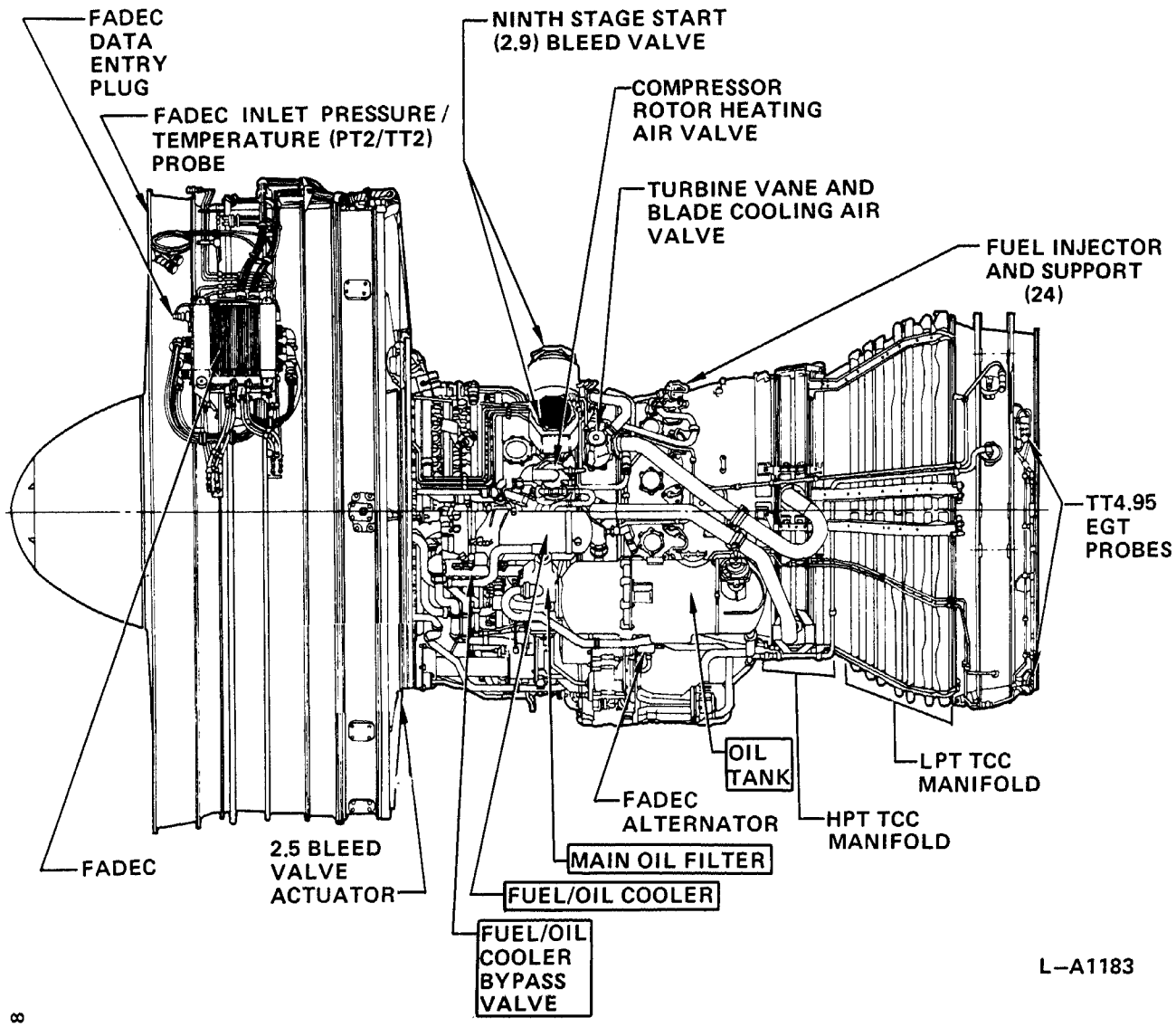
A. Pressure System
Oil is supplied to the pressure pump from the tank and is delivered to the main oil filter. In the event of filter clogging, a bypass valve is provided to ensure uninterrupted flow. Instrumentation taps are installed at filter inlet and outlet to provide direct measurement to detect an increase in filter pressure drop. The filtered, pressure oil is then routed through an air/oil heat exchanger and a fuel/oil cooler to maintain desired oil temperature prior to distribution to the main shaft bearings and gearboxes. Each heat exchanger is equipped with a bypass valve which will ensure uninterrupted flow should either exchanger or cooler pressure drop become too high. In the event of an extremely low oil temperature (i.e., a cold start), a temperature bypass valve will bypass the engine fuel/oil cooler.
Once the oil temperature has been regulated, the oil is distributed to the five (5) bearings and the main and angle gearbox. Prior to reaching the desired location, the oil is filtered again by last chance screens which are line replaceable units (LRU). The oil is metered to each compartment by flow restrictors. These restrictors are required to maintain proper flow levels which tend to be elevated due to higher supply pressures inherent with a non-regulated system.

B. Oil Temperature Management
The oil (and fuel) temperature management function addresses the regulation of fuel temperature, engine lubricating oil temperature and Integrated Drive Generator (IDG) cooling oil temperature. Under the various engine operating modes heat is rejected to the fuel via fuel/oil coolers or to engine fan discharge air via air/oil coolers. The FADEC schedules the various air, fuel and oil flow control valves as a function of fuel temperature, fuel flow rate, engine oil temperature and high rotor speed (N2).
The heat absorbed by the fuel aids in cooling the engine lubricating and IDG oil supplies. When fuel temperature exceeds 127°C (260°F), the engine oil flow to the fuel/oil heat exchanger is bypassed. Above minimum cruise speed, a fuel pump mounted diverter valve, controlled by boost stage pressure differential, causes bypass return flow from the fuel metering unit to bypass the IDG portion of the fuel/oil heat exchanger.
The engine lubricating oil circuit employs an air/oil heat exchanger in series with the fuel/oil cooler. The air/oil heat exchanger receives modulated engine fan exit air via an air flow control valve when fuel temperature exceeds 121°C (250°F). The FADEC interfaces with the air/oil heat exchanger actuator through a redundant coil torque motor driven flapper valve.
Air/oil heat exchanger valve position is sensed by dual rotational variable transformers (RVT) and feed back to the FADEC. The torque motor, RVT's and actuator are integral with the air/oil heat exchanger valve assembly. The actuator is powered by hydraulic pressure supplied by the fuel pump. In the

event of power loss or pressure loss, the valve will move to the fuel open position.


TURBINE CASE COOLING (TCC) AIR VALVE CONTROL CABLE
NINTH STAGE START (2.9) BLEED VALVE
COMPRESSOR ROTOR HEATING AIR VALVE
TURBINE VANE AND BLADE COOLING AIR VALVE
TURBINE CASE COOLING (TCC) AIR VALVE ACTUATOR
TURBINE CASE COOLING (TCC) AIR SHUTOFF VALVE (HPT)
PT2/TT2 – INLET PROBE
TURBINE CASE COOLING (TCC) AIR SHUTOFF VALVE (LPT)
TURBINE VANE AND BLADE COOLING AIR VALVE POSITION SWITCH
TT4.95 EGT PROBES
VARIABLE STATOR VANE ACTUATOR
FUEL DISTRIBUTION VALVE
IGNITER LEADS
FUEL METERING UNIT (FMU)
EGT (TT4.95) BOX AND CABLE
FUEL PUMP FILTER DIFFERENTIAL PRESSURE SWITCH
LUBRICATION AND SCAVENGE OIL PUMP
EXCITER (2)
FUEL T/C
FUEL PUMP
OIL T/C
L–A1182
BM5 79 21 00 0 KAMO - 18

Engine External Components (Right Side)
Figure 001



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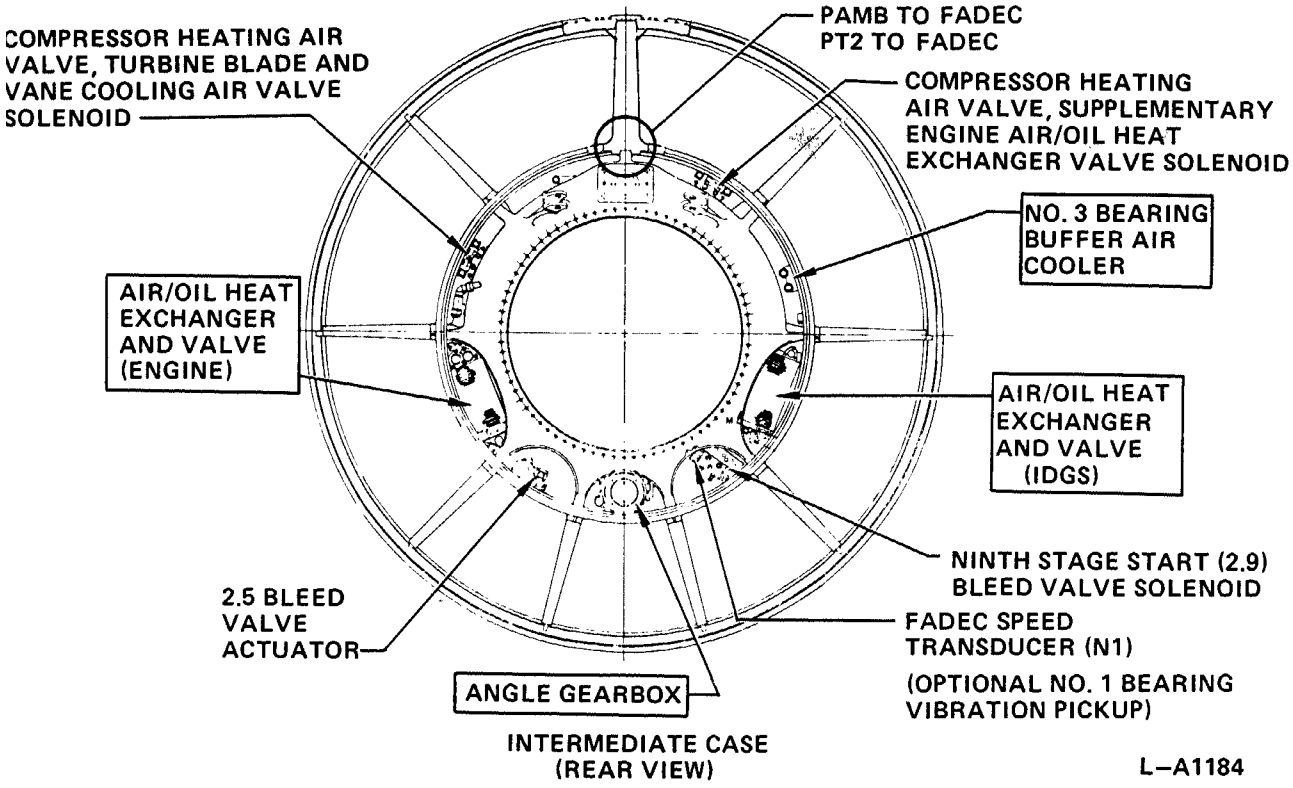
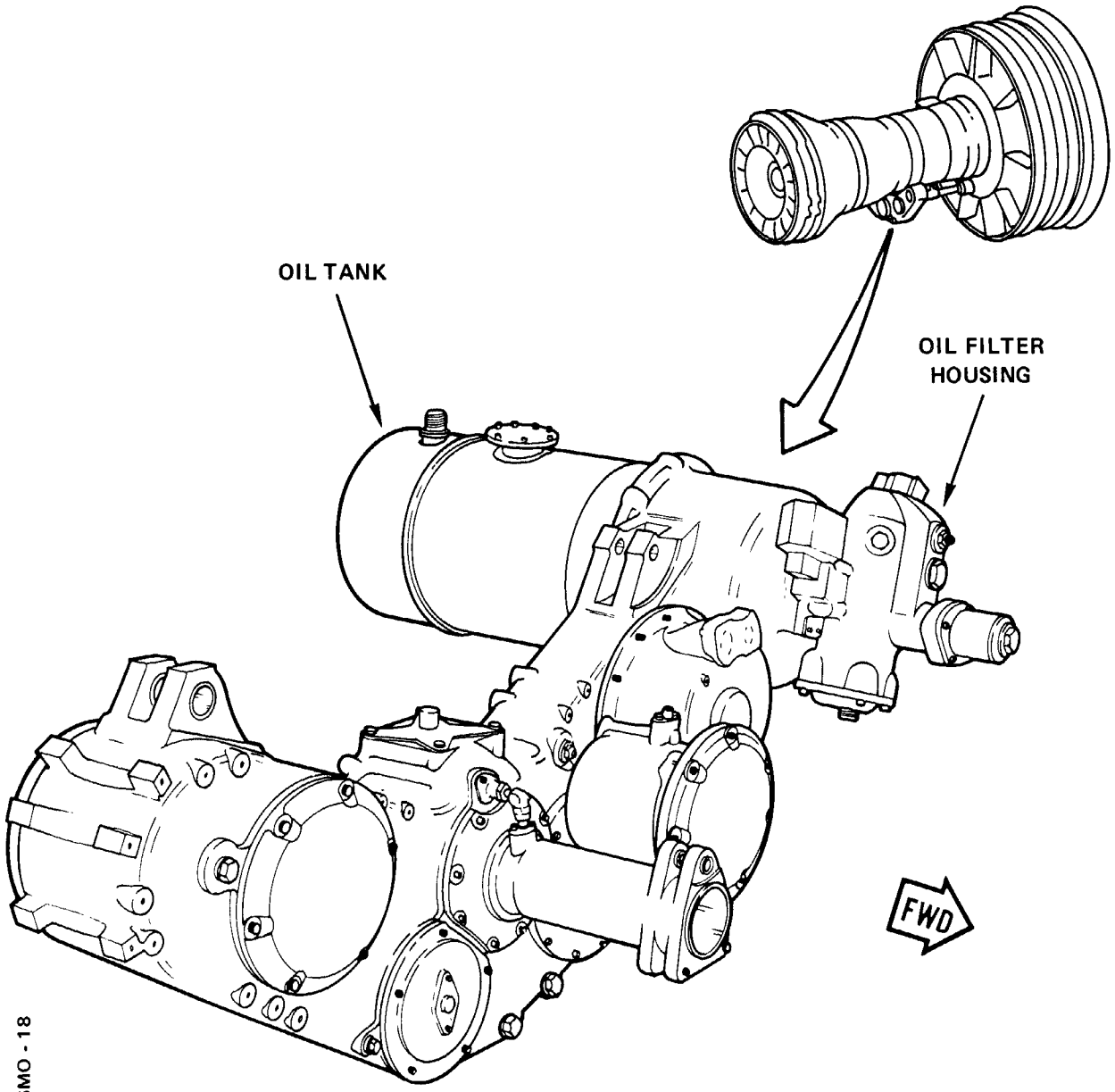
Engine External Components (Left Side)
Figure 002


COMPRESSOR HEATING AIR VALVE, TURBINE BLADE AND VANE COOLING AIR VALVE SOLENOID
PAMB TO FADEC
PT2 TO FADEC
COMPRESSOR HEATING AIR VALVE, SUPPLEMENTARY ENGINE AIR/OIL HEAT EXCHANGER VALVE SOLENOID
NO. 3 BEARING BUFFER AIR COOLER
AIR/OIL HEAT EXCHANGER AND VALVE (ENGINE)
AIR/OIL HEAT EXCHANGER AND VALVE (IDGS)
NINTH STAGE START (2.9) BLEED VALVE SOLENOID
2.5 BLEED VALVE ACTUATOR
FADEC SPEED TRANSDUCER (N1)
(OPTIONAL NO. 1 BEARING VIBRATION PICKUP)
ANGLE GEARBOX
INTERMEDIATE CASE (REAR VIEW)
L-A1184

BM5 79 21 00 0 KEMO - 18

Engine External Components - Intermediate Case View
Figure 003



Main Gearbox
Figure 004

2. Component Location
(Ref. Fig. 005, 006)

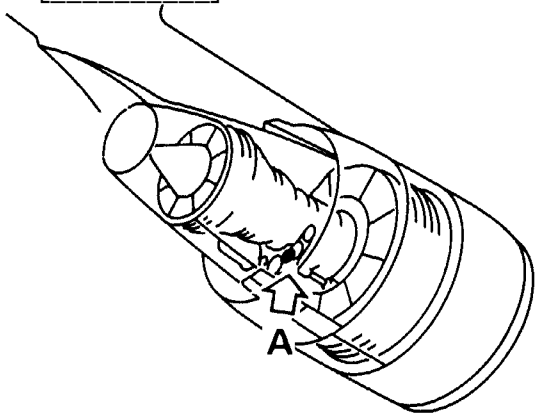
R **ON A/C 101-104,

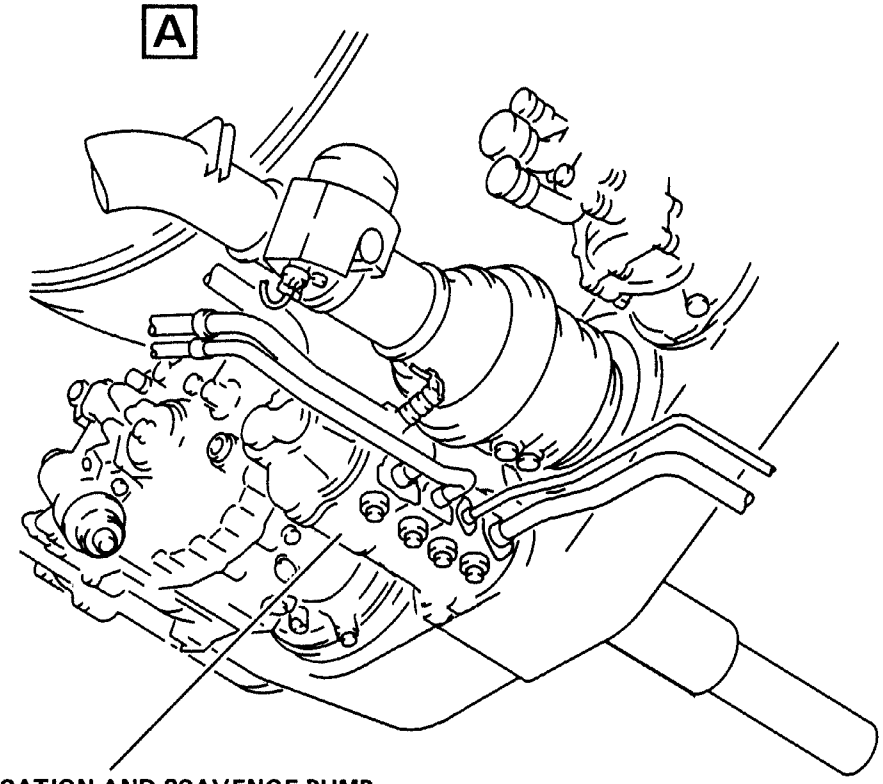
R Post SB 72-2030 For A/C 101-104,

2. Component Location
(Ref. Fig. 005, 007)

**ON A/C 101-200,

FIN	FUNCTIONAL DESIGNATION	PANEL	ZONE	ACCESS DOOR	ATA REF.
	OIL PUMP - LUBRICATION AND SCAVENGE		452	436AR	79-21-02
			462	446AR	79-21-02
	FILTER - OIL		451	435AL	79-21-03
			461	445AL	79-21-03
	REGULATOR VALVE - OIL PRESSURE		451	435AL	79-21-04
			461	445AL	79-21-04
	COOLER - FUEL/OIL		451	435AL	79-21-05
			461	445AL	79-21-05
	BYPASS VALVE - FUEL/OIL COOLER		451	435AL	79-21-07
			461	445AL	79-21-07
	PRESSURE RELIEF VALVE - MAIN OIL		451	435AL	79-21-08
	FILTER		461	445AL	79-21-08
	SOLENOID - FUEL OIL COOLER BYPASS		451	435AL	79-21-11
	VALVE		461	445AL	79-21-11
	HEAT EXCHANGER AND VALVE - AIR/OIL		451	435AL	79-21-12
			461	445AL	79-21-12

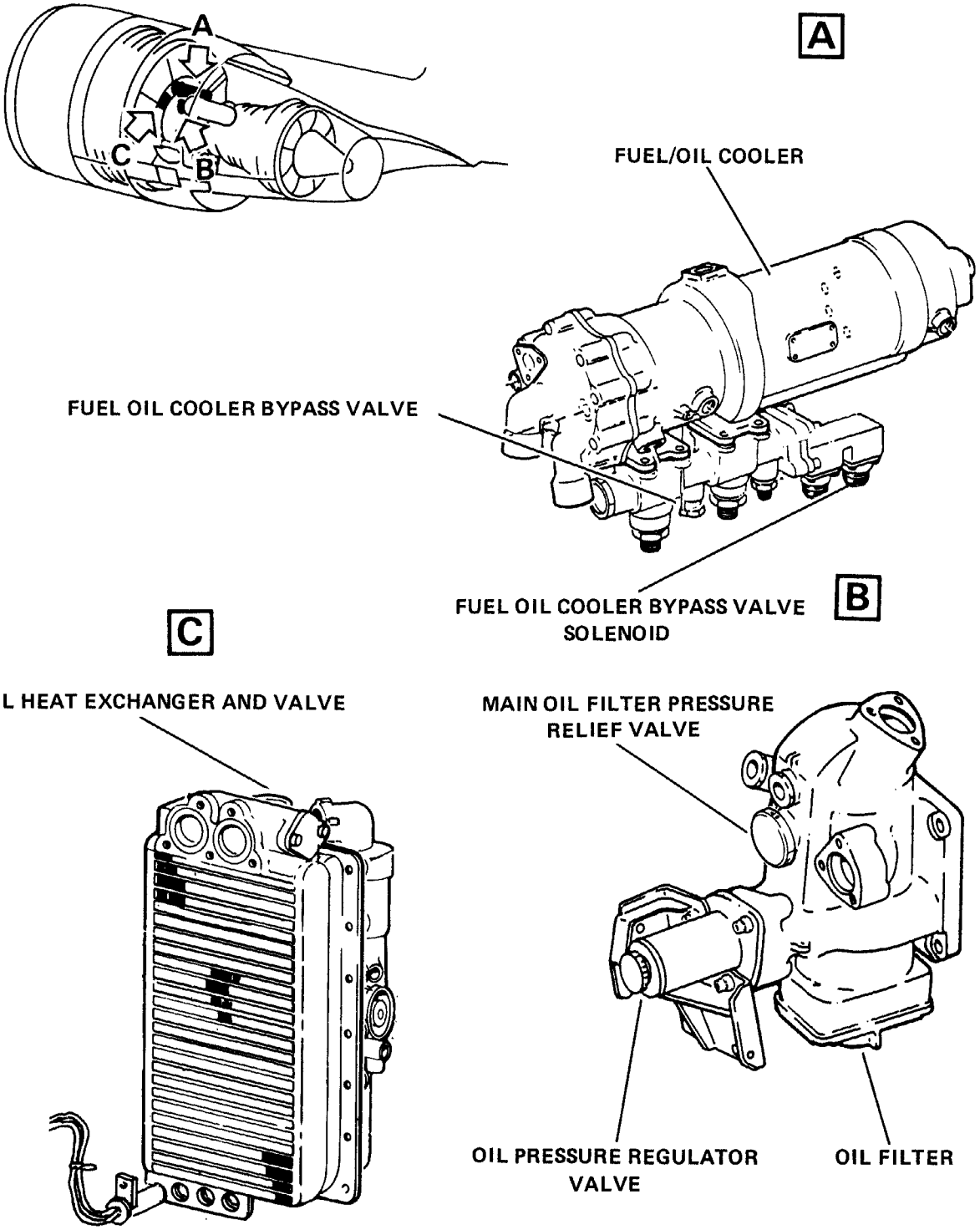




LUBRIFICATION AND SCAVENGE PUMP

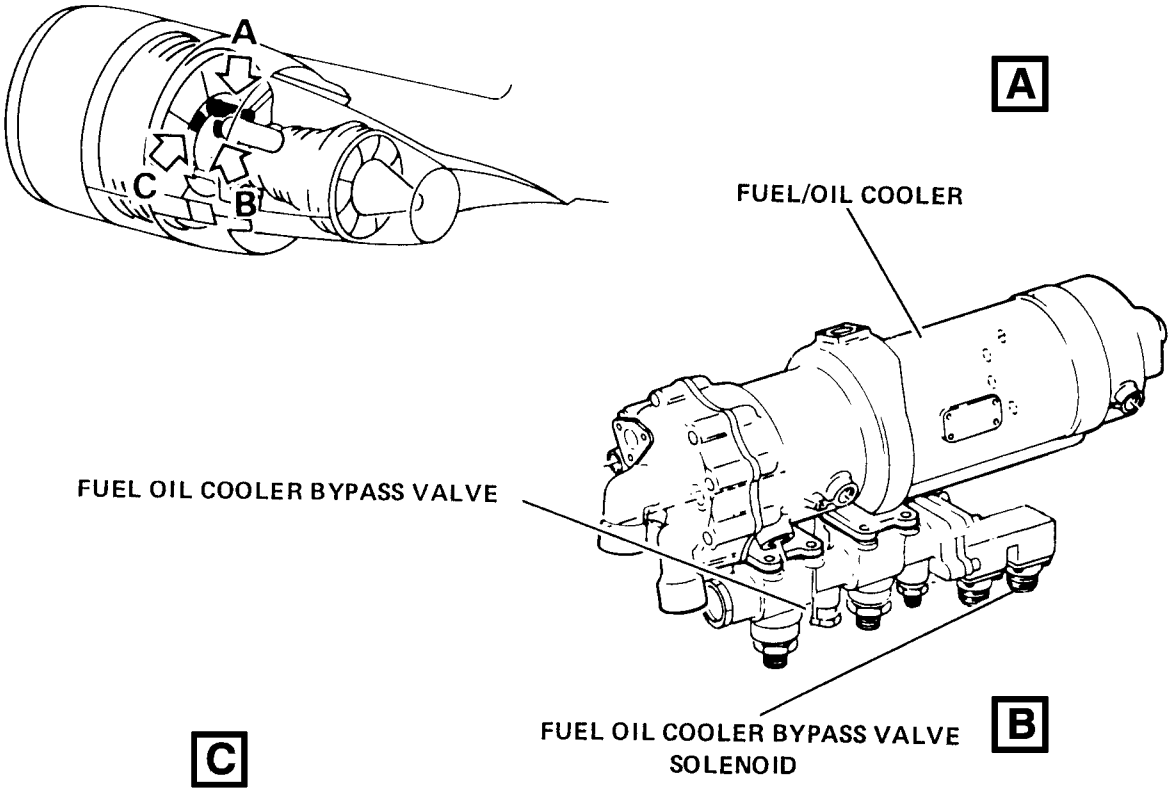
BM5 79 21 00 0 KHMO - 00/29 - 00/24
DM5

Supply - Component Location
Figure 005



BM5 79 21 00 0 KHNO - 00/29 - 00/24
DM5

Supply - Component Location
Figure 006



BM5 79 21 00 0 KHP0 00

Supply - Component Location
Figure 007

**ON A/C 101-200,

3. Lubrication and Scavenge Oil Pump (Ref. Fig. 010, 011)
The lubrication and scavenge oil pump provides engine oil for lubrication and scavenge functions of the engine bearing compartments and the angle and main gearboxes.
The assembly is externally mounted on the aft face of the gearbox and driven by the main gearbox. The assembly is a non-pressure regulated gear pump consisting of six stages : one main lubrication pump and five scavenge pump stages ; one each for the No. 1, 1.5 and 2 bearing compartment, No. 3 bearing compartment, No. 4 bearing compartment, angle gearbox and the main gearbox.
R The inlet of each scavenge pump has metal chip collectors.

4. Main Oil Filter (Ref. Fig. 008)
Main oil filter housing is bolted to the oil tank housing on the left side of the main gearbox. The filter is a single element disposable unit.
In the event of particles clogging the filter element, a bypass valve is actuated based upon the pressure drop sensed across the filter. Ports are provided for an impending bypass signal transmitter.

R **ON A/C 101-104,

R Post SB 72-2030 For A/C 101-104,

3. Lubrication and Scavenge Oil Pump (Ref. Fig. 010, 011)
The lubrication and scavenge oil pump provides engine oil for lubrication and scavenge functions of the engine bearing compartments and the angle and main gearboxes.
The assembly is externally mounted on the aft face of the gearbox and driven by the main gearbox. The assembly is a non-pressure regulated gear pump consisting of six stages : one main lubrication pump and five scavenge pump stages ; one each for the No. 1, 1.5 and 2 bearing compartment, No. 3 bearing compartment, No. 4 bearing compartment, angle gearbox and the main gearbox.
R The inlet of each scavenge pump has metal chip collectors.

4. Main Oil Filter (Ref. Fig. 009)
Main oil filter housing is bolted to the oil tank housing on the left side of the main gearbox. The filter is a dual element disposable unit.
In the event of particles clogging the primer filter element, a bypass valve is actuated based upon the pressure drop sensed across the filter. Ports are provided for an impending bypass signal transmitter.

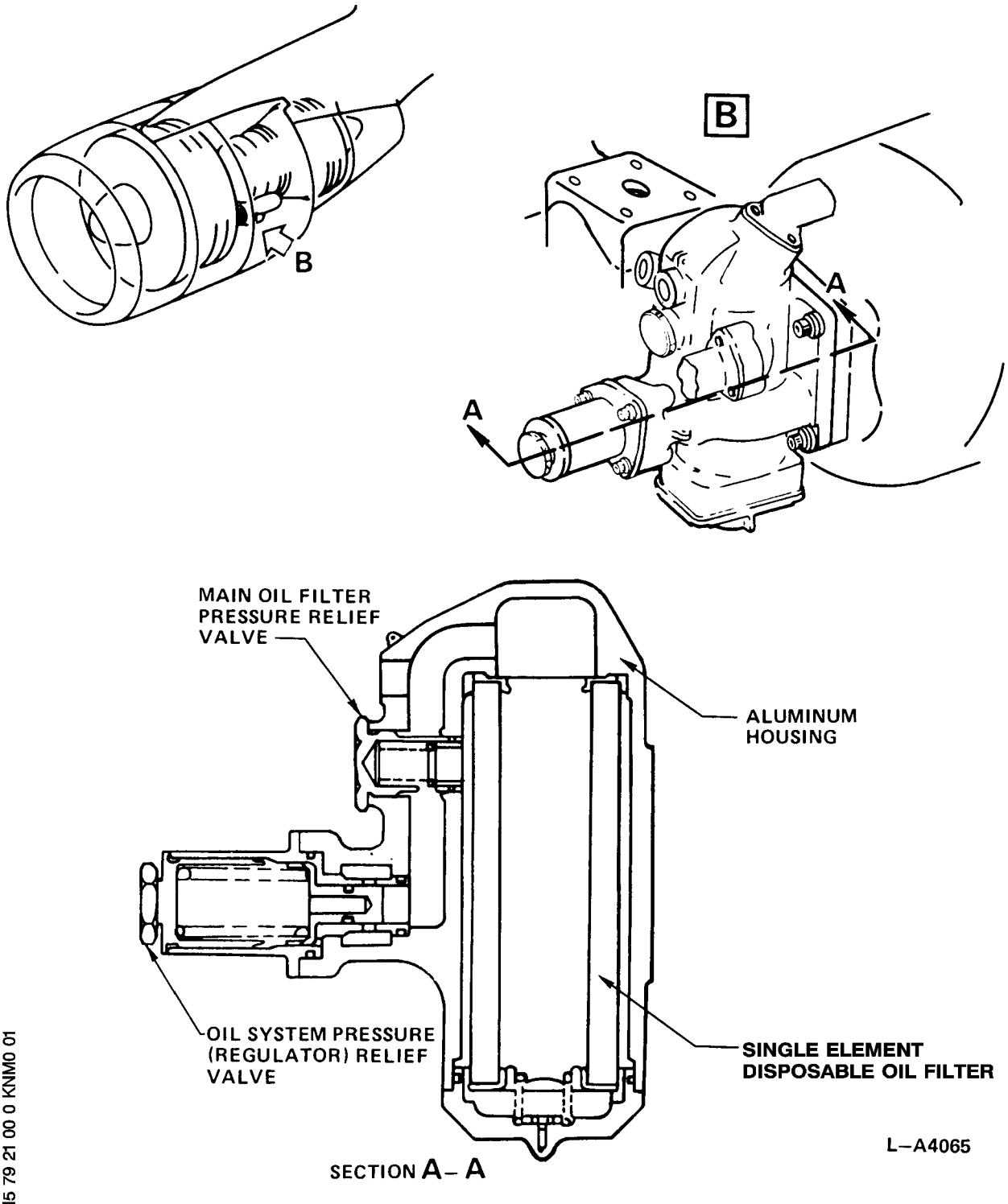
**ON A/C 101-200,

5. Fuel/Oil Cooler (Ref. Fig. 012)

A. The fuel/oil cooler serves to remove engine heat from the oil and also is used to automatically anti-ice the fuel pump filter. Fuel from the aircraft supply is pumped through the centrifugal boost stage of the fuel pump and passes through the cooler extracting heat from the engine oil. The fuel then flows through the fuel filter back into the fuel pump.

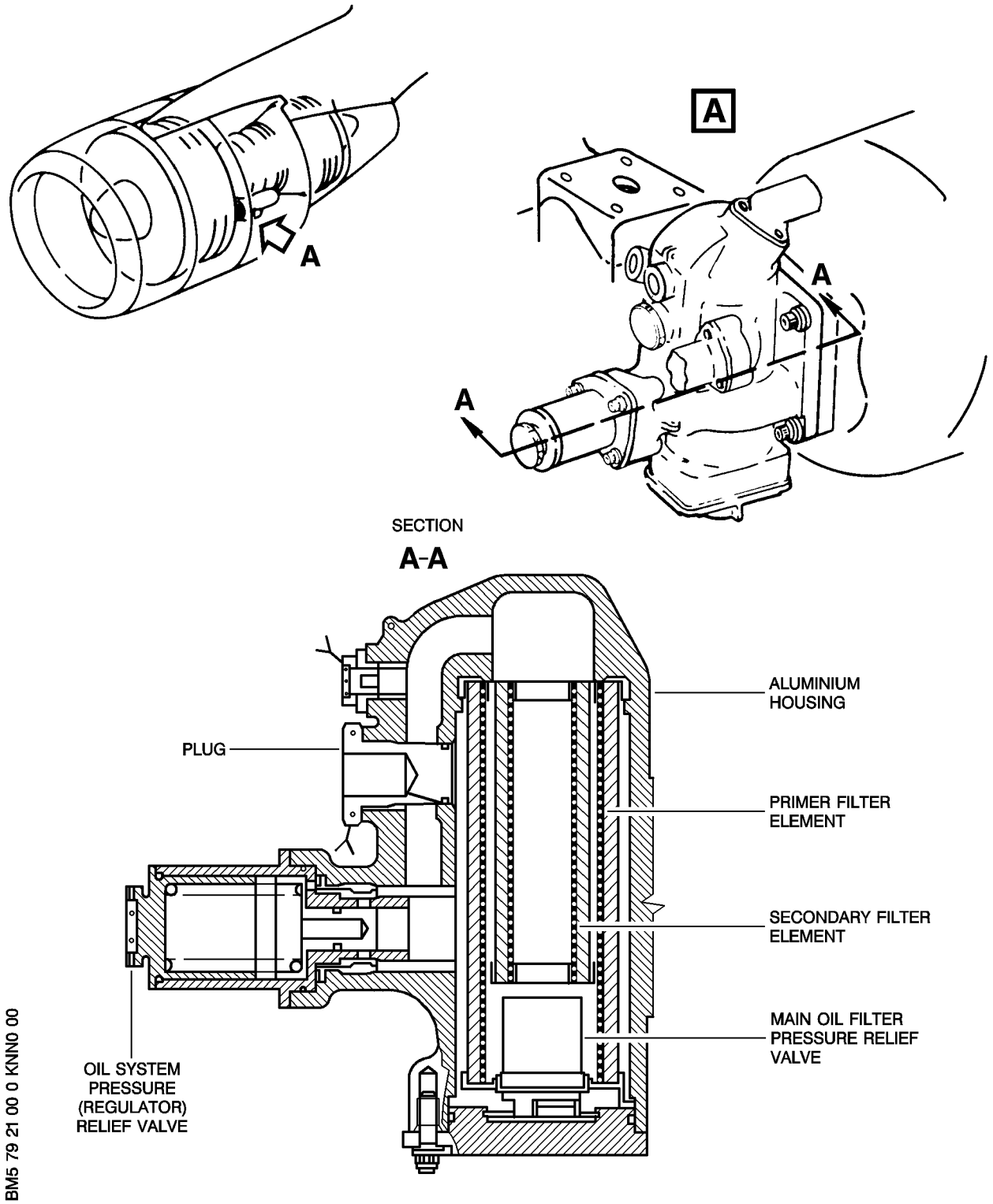
B. The cooler is a shell and tube type with a single housing with a common fuel passage and two separate oil passages to service both the IDG oil system and the engine oil system. The lubrication oil is input from the air/oil heat exchanger and is directed by baffles to flow around the tubes through which the fuel flows. Heat transfer through the tube walls elevates fuel temperature.

C. The oil system has two bypass valves for the fuel/oil cooler, one is temperature sensitive to bypass oil in the instance of cold starts and the second is a pressure sensitive bypass in the event of oil core blockage. Both valves permit uninterrupted oil flow to the bearing compartments and gearboxes. During engine warm-up following start, the temperature bypass valve will close to flow oil through the cooler as oil temperature increases.

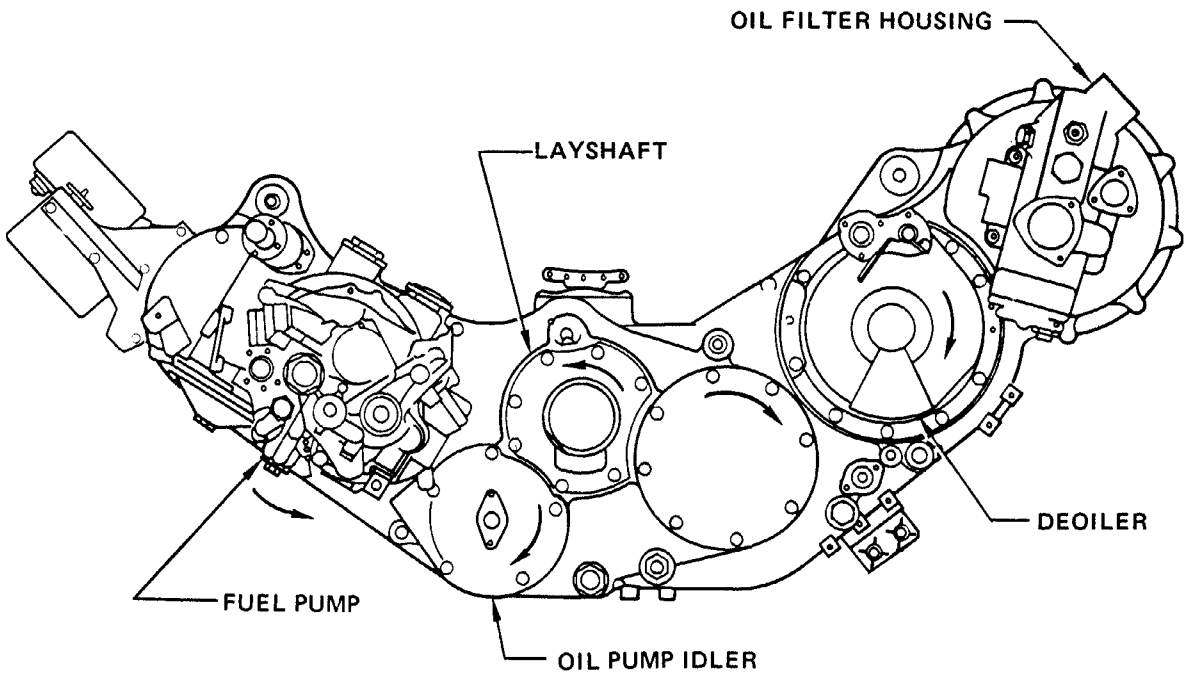


BM5 79 21 00 0 KNM0 01

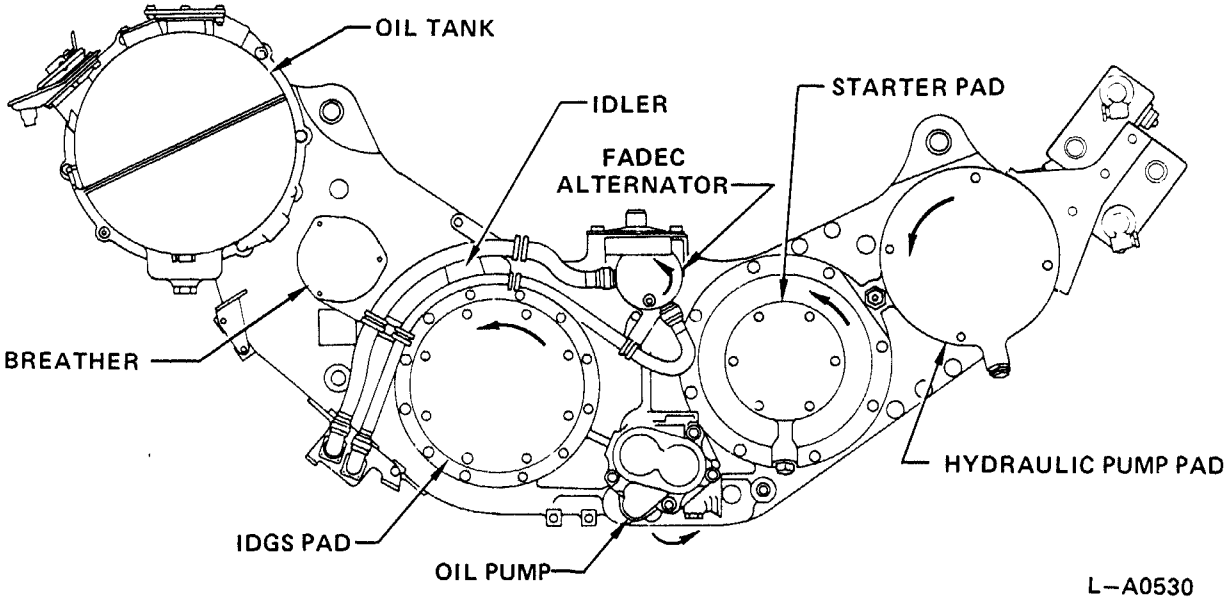
Main Oil Filter
Figure 008



Main Oil Filter
Figure 009



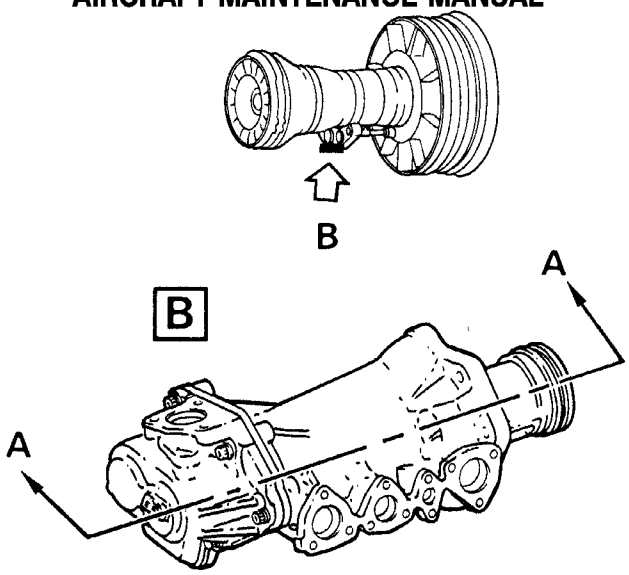
FRONT VIEW



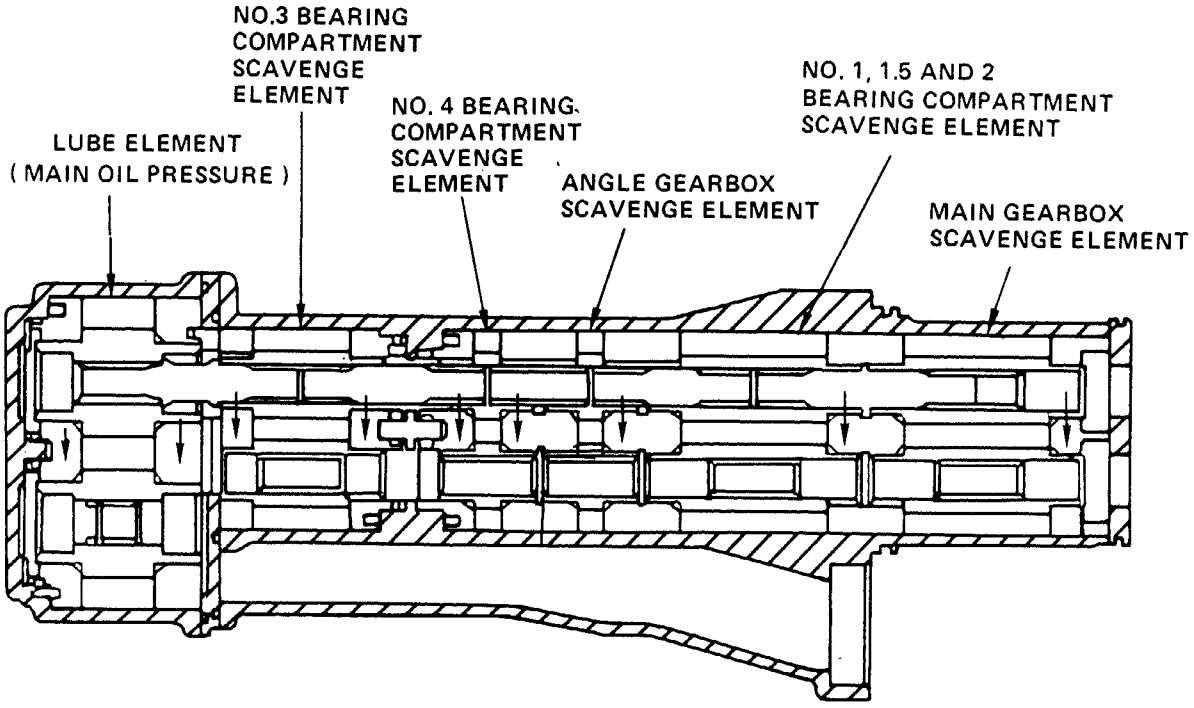
REAR VIEW

BM5 79 21 00 0 KJMO - 19

Main Gearbox Accessory Drives
Figure 010



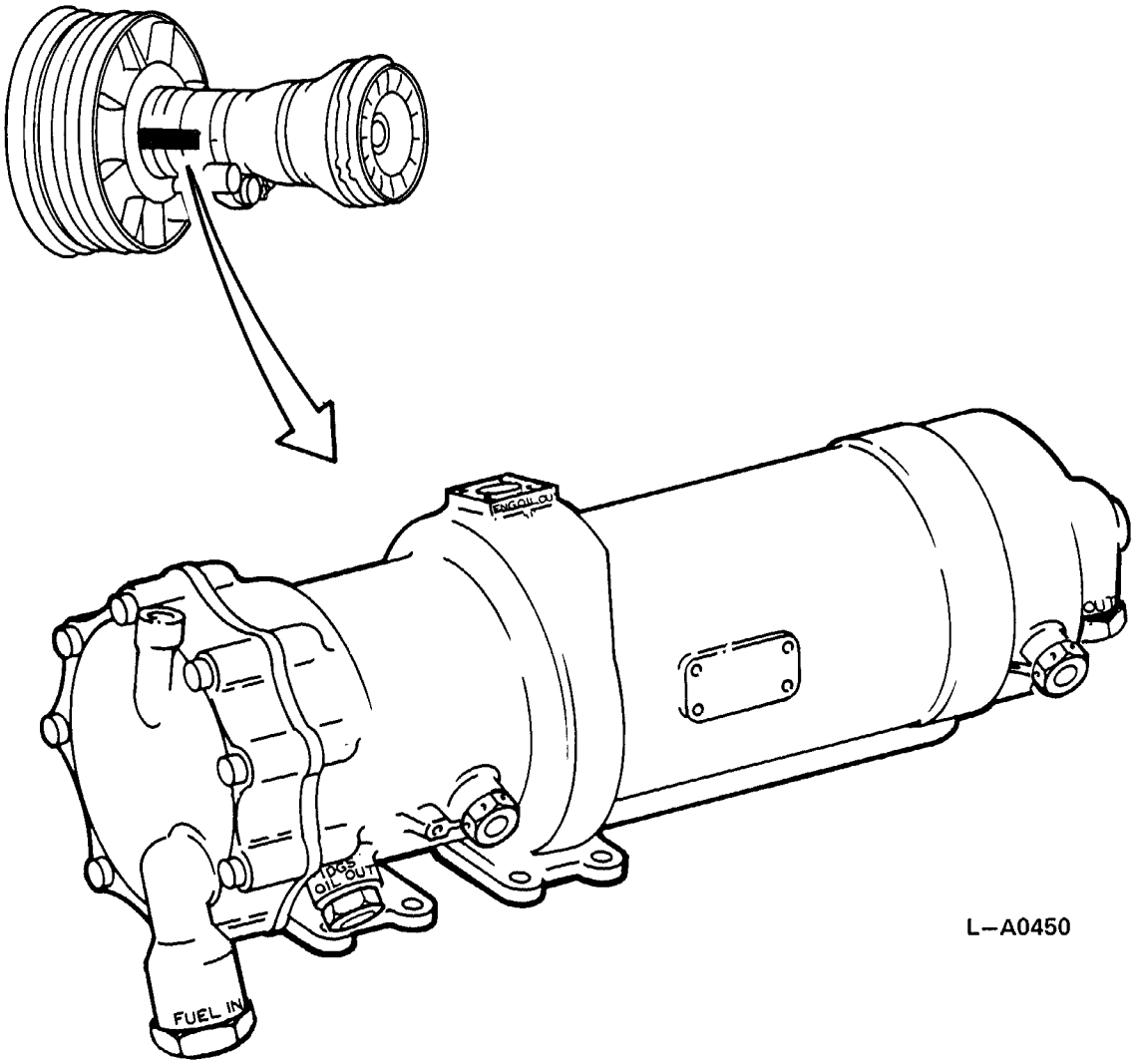
LUBRICATION AND SCAVENGE OIL PUMP


NO.3 BEARING COMPARTMENT SCAVENGE ELEMENT
LUBE ELEMENT (MAIN OIL PRESSURE)
NO. 4 BEARING COMPARTMENT SCAVENGE ELEMENT
ANGLE GEARBOX SCAVENGE ELEMENT
NO. 1, 1.5 AND 2 BEARING COMPARTMENT SCAVENGE ELEMENT
MAIN GEARBOX SCAVENGE ELEMENT

SECTION A - A

BM5 79 21 00 0 KLMO - 24 - 19
DM5

Lubrication and Scavenge Oil Pump
Figure 011



L-A0450

BM5 79 21 00 0 KPMO - 18

Fuel/Oil Cooler
Figure 012

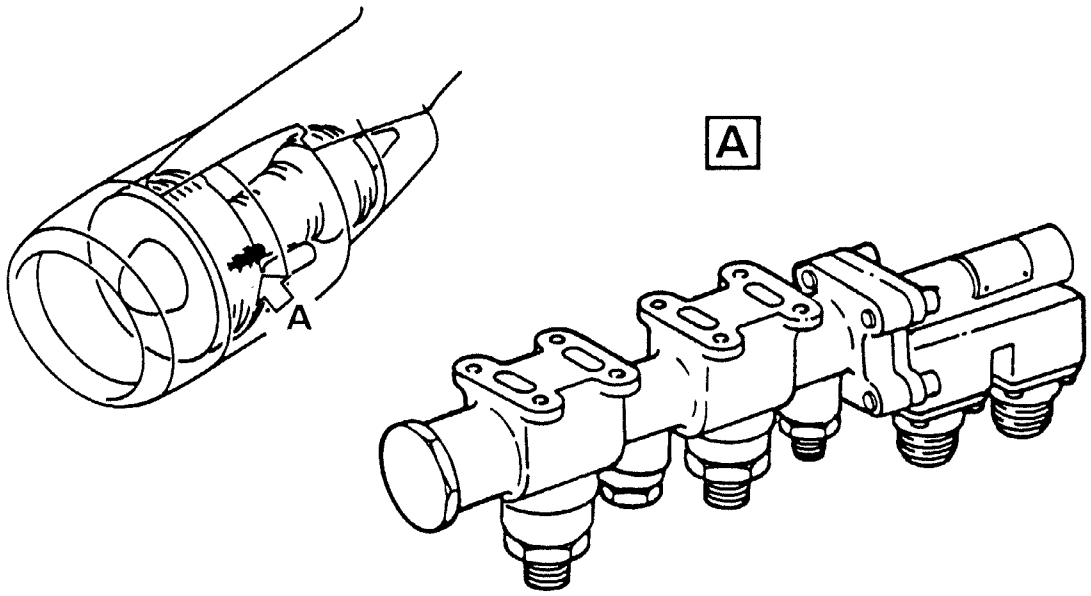
6. Fuel/Oil Cooler Bypass Valve and Solenoid(Ref. Fig. 013)

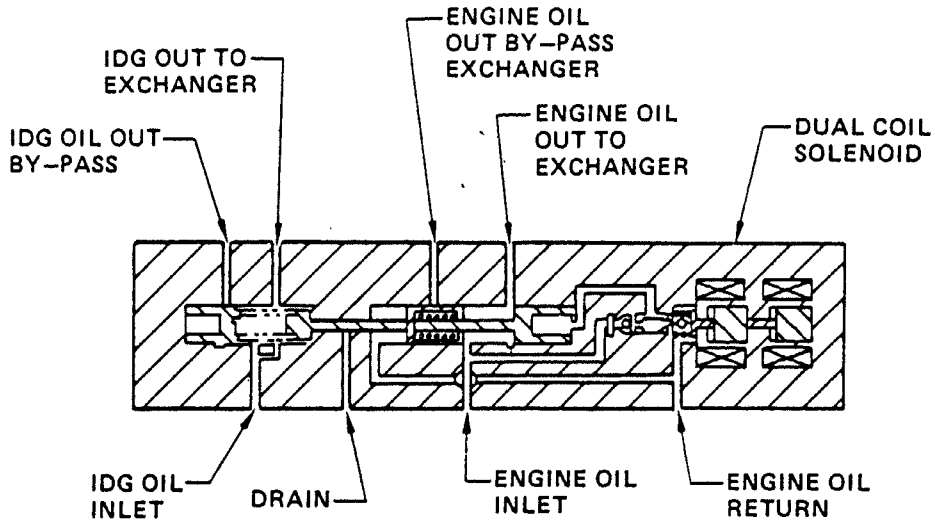
A. General
The bypass valve is mounted on the fuel/oil cooler and consists of electromagnetically controlled, three way spool valves, which, when energized, will bypass engine oil around the engine fuel/oil cooler. The valve is actuated by a single dual coil solenoid, using engine oil as servo pressure. Each channel of the FADEC controls one coil of the solenoids. Aircraft 28VDC power is supplied to the solenoid valve by solid state swithching within the FADEC. A pressure relief valve is incorporated in the engine oil system to bypass the oil under cold start conditions.

B. Fuel/Oil Bypass Valve Solenoid (Ref. Fig. 014)
(1)Description
The fuel/oil bypass valve consists of a solenoid, slide assembly, cartridge valve and housing. It is designed to control the flow of engine oil to the heat exchanger when oil cooling is required.
(2)Operation
With no electrical signal, the normally closed solenoid operated pilot valve ports engine oil return pressure to the pilot cavity on the right side of the engine oil system slide valve. Since the left side of the engine oil slide valve is always ported to engine oil return, the slide valve is always ported to engine oil return, the slide valve is pressure balanced during the condition. IDG pressure acting on the actuation rod aids the spring which drives the engine oil slide to the right, thereby allowing normal flow through both system heat exchangers.
If the pressure differential between the engine oil heat exchanger inlet and outlet should exceed 50 psi (3.45 bars), the force on the relief valve poppet will cause the relief valve spring to collapse, allowing the poppet to open and pass the required flow from engine oil inlet to heat exchanger outlet.
When the dual coil solenoid operated pilot valve is energized with either electrical system, engine oil pressure is ported to the pilot cavity on the right-hand side of the engine oil slide valve. Since the left side of the slide is ported to return, a differential pressure exists which drives the engine oil slide valve and actuation rod against the spring and into the bypass position.
When both solenoid coils are de-energized, the spring returns the engine oil system to the non-bypassing mode as described above.

7. Air/Oil Heat Exchanger and Valve (Engine) (Ref. Fig. 015)

A. The air/oil heat exchanger consists of one housing to service the engine oil system. The oil in and return ports are located on the same side of the heat exchanger facing aft. Engine oil is routed into two semi-cylindrical heads at the top of unit and is collected and returned at the bottom in two semi-cylindrical plenum. A relief valve, set at 50 psid (3.45 bars) is incorporated between the inlet and return ports to bypass the oil under cold start conditions. The heat exchanger utilizes fan discharge air which is ducted from the 2.5 bleed valve duct and modulated by the air/oil heat exchanger valve.



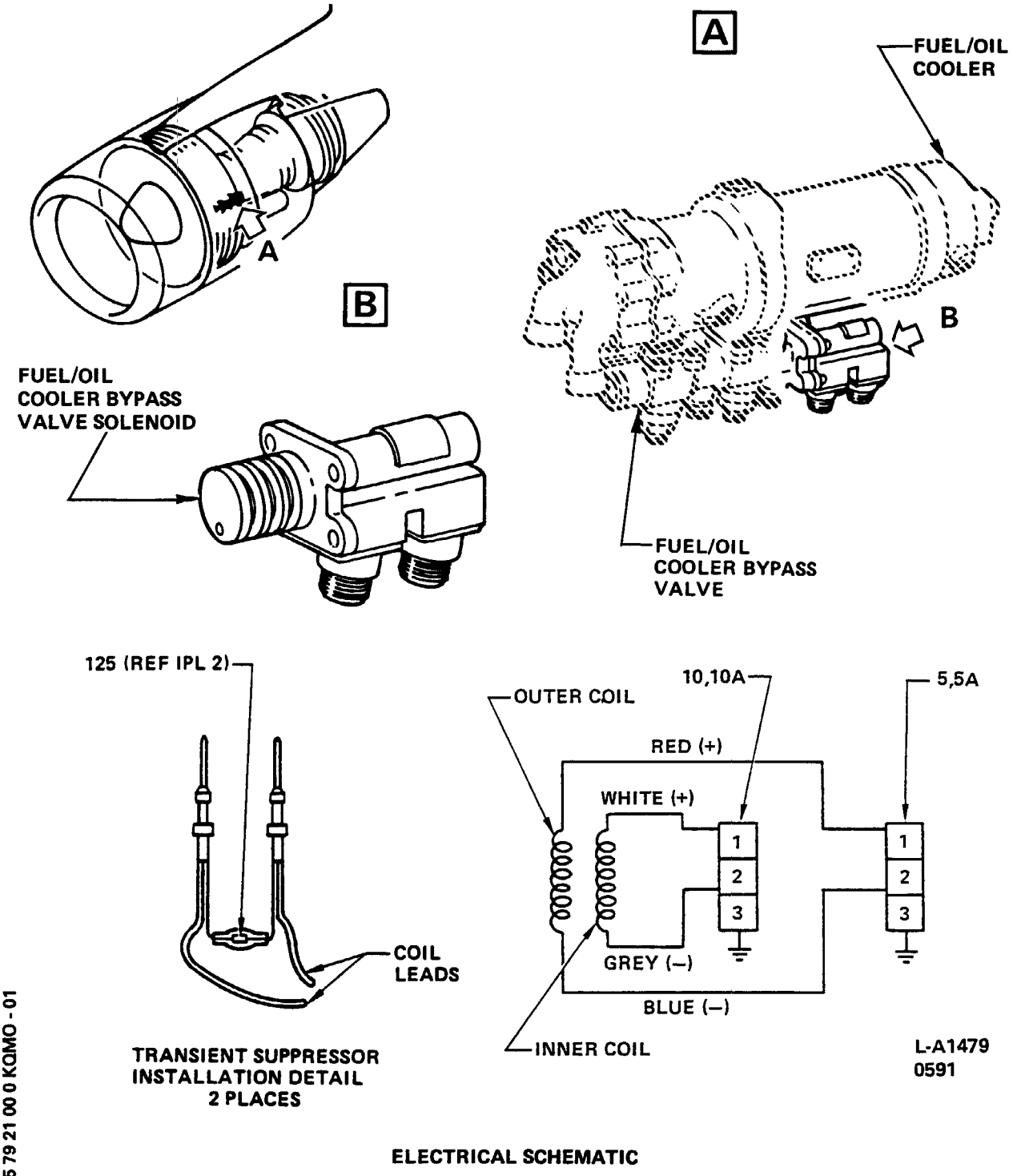


NOTE: SHOWN DE–ENERGIZED AND DEPRESSURIZED

HYDRAULIC SCHEMATIC

BM5 79 21 00 0 KPNO - 24 - 19
DM5

Fuel/Oil Cooler Bypass Valve and Solenoid - Hydraulic Schematic
Figure 013



BM5 79 21 00 0 KQMO - 01

ELECTRICAL SCHEMATIC

Fuel/Oil Cooler Bypass Valve Solenoid Electrical Schematic
Figure 014

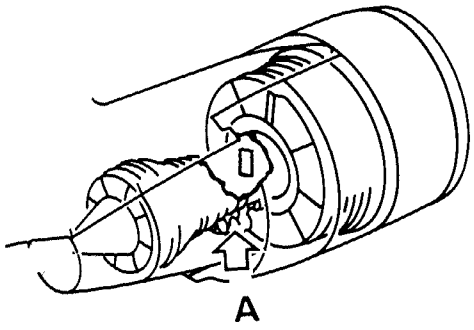
B. The air/oil heat exchanger valve modulates fan discharge air to the heat exchanger at high oil heat conditions during engine idle and low power operation and is located just forward and directly bolted to the air/oil heat exchanger.

C. The valve consists of four main subassemblies housed in one body ; dual butterfly valves mounted on a single driveshaft, fuel pressure-driven actuator, dual rotary variable transformer (RVT) and dual coil torque motor. Valve operation is accomplished by an input signal from the FADEC to the torque motor. The torque motor modulates pressures which act upon each side of the actuator piston, thus causing a change in the actuator position. Movement of the actuator rotates the two butterfly valves through a connecting link. The butterfly valve angular position is measured by the RVT mounted on the end of the butterfly valve drive shaft.

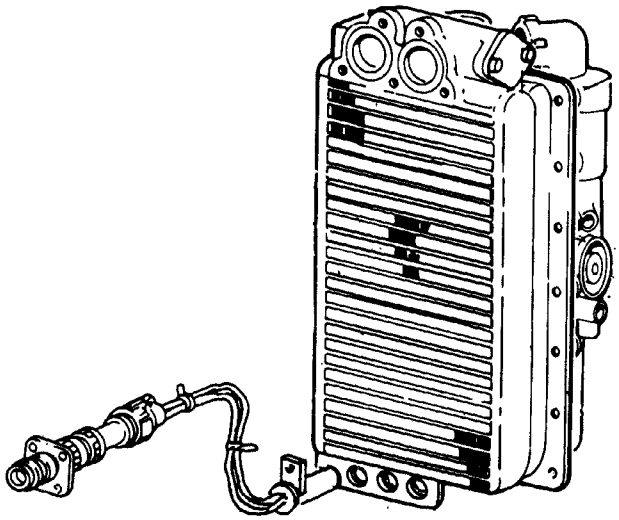
D. The valve assembly is designed to failsafe open in the event of electrical or fuel pressure failure.

8. Oil Filter Pressure Relief Valve (Ref. Fig. 008)

A. Mounted on the oil filter housing and controlled by the pressure differential of the filter, this valve provides uninterrupted oil flow to the main bearings and gearboxes by bypassing the filter element in the event of filter clogging.



A



L-A4066

BM5 79 21 00 0 KTMO - 24 - 19
DM5

Air/Oil Heat Exchanger and Valve (Engine)
Figure 015

R **ON A/C 101-104,

R Post SB 72-2030 For A/C 101-104,

8. Oil Filter Pressure Relief Valve (Ref. Fig. 009)

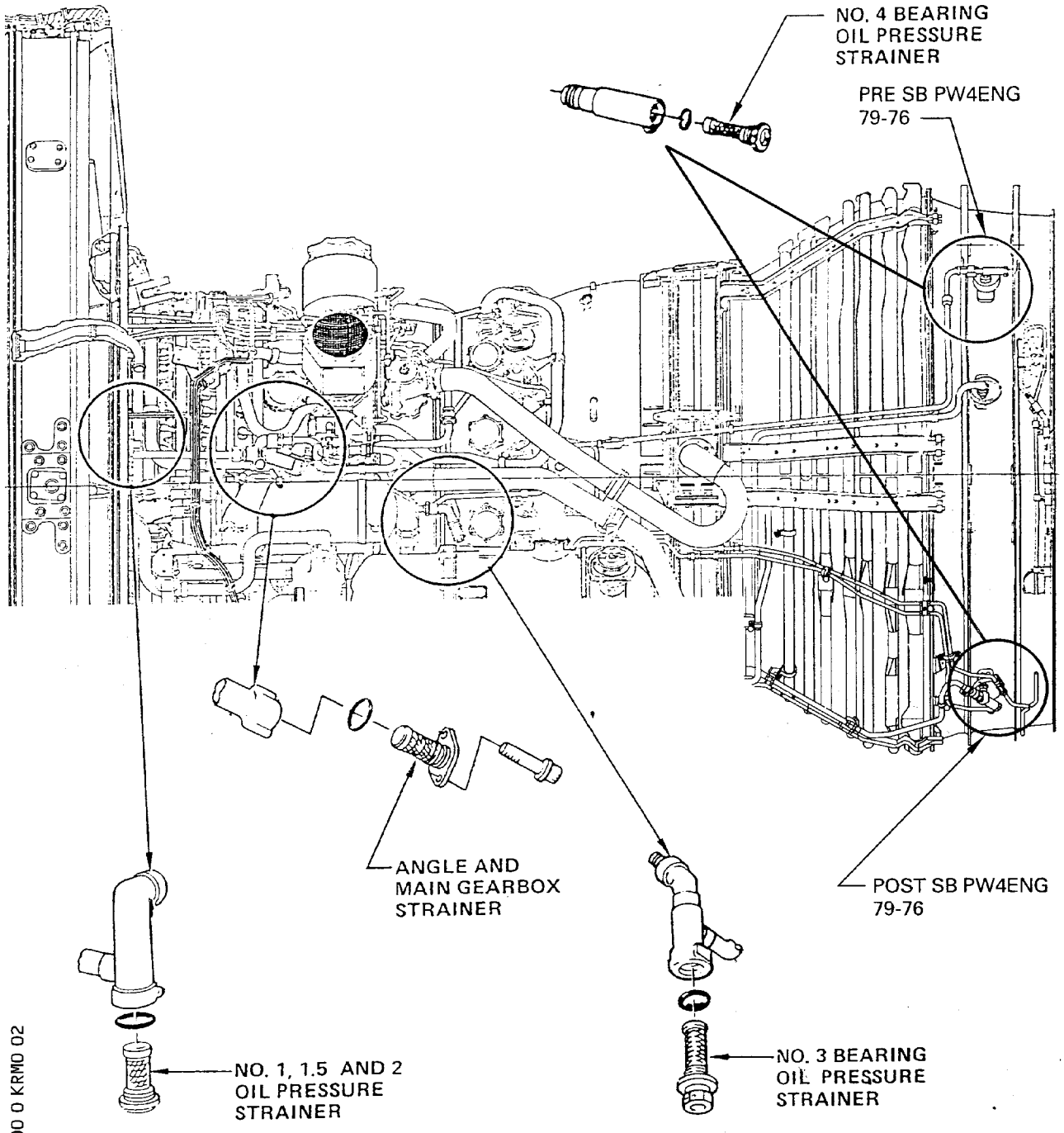
A. Mounted on the oil filter housing and controlled by the pressure differential of the filter, this valve provides uninterrupted oil flow to the main bearings and gearboxes by bypassing the primer filter element in the event of primer filter element clogging.

**ON A/C 101-200,

9. Bearing Lubrication and Last Chance Oil Strainers (Ref. Fig. 016)

A. The final component the oil must pass through before delivery to the bearings or gearboxes are the last chance strainers. There are four strainers and they are assigned as follows :
Strainer 1 - No. 1, 1.5 and 2 bearings
Strainer 2 - Angle and main gearbox
Strainer 3 - No. 3 bearing
Strainer 4 - No. 4 bearing.

B. The strainers are sized at 0.023 in (0.584 mm) and are all line replaceable units.
Engine oil is routed into two semi-cylindrical heads at the top of the unit and is collected and returned at the bottom in two semi-cylindrical plenum. A relief valve, set at 50 psid (3.45 bars) is incorporated between the inlet and return ports to bypass the oil under cold start conditions. The heat exchanger utilizes fan discharge air which is ducted from the 2.5 bleed valve duct and modulated by the air/oil heat exchanger valve.



BM5 79 21 00 0 KRM0 02

Last Chance Oil Strainers
Figure 016

R

LUBRICATION AND SCAVENGE OIL PUMP - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P03-001	Oils (Ref. 70-00-00)
R C. Material No.P06-054	Lubricants (Ref. 70-00-00)
D.	Container, Approx. Capacity 10 US Gal. (38 L.)
E.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
F.	Torque Wrench
G.	Packings
H. PWA86630	Jackscrew Puller (2 are necessary) Optional to PWA88774 Jackscrew Puller
I. PWA88774	Jackscrew Puller (2 are necessary) Optional to PWA86630 Jackscrew Puller
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)Remove the magnetic chip collector assemblies in the main gearbox and oil tank (Ref. 79-22-03, P. Block 401).

B. Removal (Ref. Fig. 401, 402, 403)

(1)Disconnect electrical harness from pump.

Pre SB PW4ENG 79-75

(2)Remove bolts securing bracket and flange of main oil filter tube assembly (LP01) to top rear port on oil pump. Loosen bolt securing clamps to bracket and reposition bracket clear of pump. (Ref. Fig. 401)

END Pre SB PW4ENG 79-75

Post SB PW4ENG 79-75

(3)Loosen the main oil filter hose and tube assembly (LP01) and the fluid pressure dampener or (Post SB PW4ENG 79-86) adapter as follows (Ref. Fig. 402, 403).

(a)Remove the bolts that hold the tube to the top of the fluid pressure dampener or adapter.

(b)Remove bolt, nut and clamp securing tube to diffuser case bracket at approximately 7 o'clock position.

(c)Remove bolts, nuts and clamps securing tube to gearbox brackets.

(d)If applicable, remove the bolts that hold the fluid pressure dampener or adapter to the top of the main oil pump.

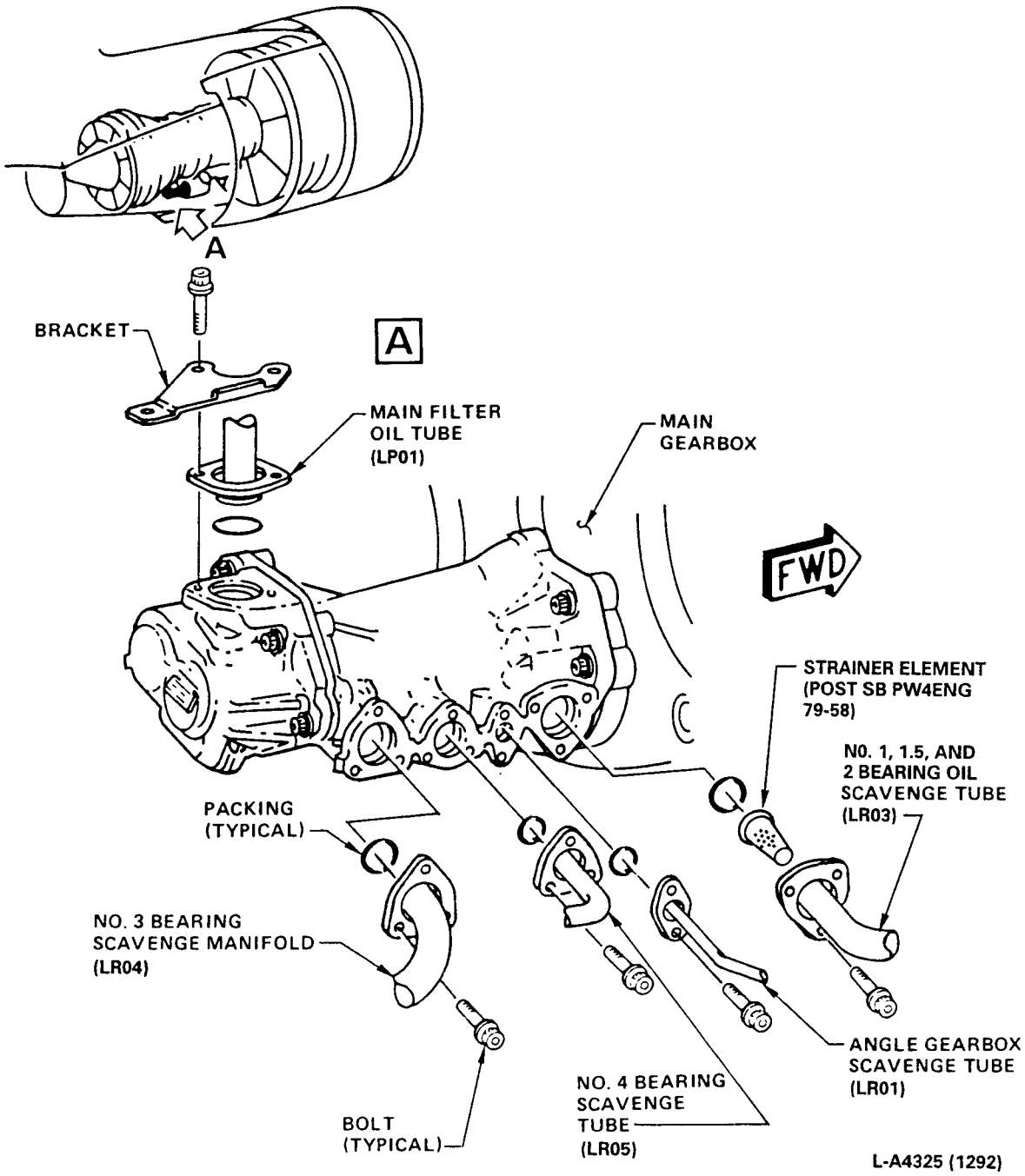
(e)If applicable, remove the loop clamp bracket from the dampener or adapter.
(f)If applicable, remove the dampener or adapter from the pump.
(g)Discard packings from the hose and tube assembly and from the dampener or adapter, as applicable.

END SB PW4ENG 79-75

(4)Remove bolts securing flanges of the following scavenge tubes starting at right rear of pump and working forward.
(a)No. 3 bearing scavenge manifold assembly (LR04).
(b)No. 4 bearing scavenge tube assembly (LR05).
(c)Angle gearbox scavenge tube assembly (LR01).
(d)No. 1, 1.5 and 2 bearing oil scavenge tube assembly (LR03).
1 (Post SB PW4ENG 79-58) remove the strainer element from the No. 1, 1.5 and 2 bearing oil scavenge tube assembly (LR03).
(5)Loosen clamps on tubes as necessary to allow flexibility for tube flanges to be disengaged from pump.
(6)Remove the oil pump from the main gearbox as follows : (Ref. Fig. 401)
(a)Remove the four bolts and washers that attach the oil pump to the main gearbox.
(b)Two of the four oil pump flange bolt holes (where you just removed the bolts) have threads. Find the two threaded holes and install two PWA86630 or PWA88774 Jackscrew Pullers.
NOTE : If you can not find the two threaded bolt holes on the oil pump flange, you can not use the two PWA86630 or PWA88774 Jackscrew Pullers to remove the oil pump. To remove oil pumps without threaded bolt holes, carefully pull on the pump to remove it from the gearbox.
NOTE : To get the two threaded bolt holes in the oil pump flange, see Sundstrand Service Bulletin 5008437-79-4.
(c)Turn the two PWA86630 or PWA88774 Jackscrew Pullers with your hand until they touch the gearbox.
(d)Turn the two PWA86630 or PWA88774 Jackscrew Pullers equally with a wrench until the oil pump is disengaged from the gearbox.
(e)Carefully remove the oil pump from the main gearbox.
(7)Remove the two PWA86630 or PWA88774 Jackscrew Pullers from the threaded holes of the oil pump.
(8)Remove the two large packings from the front of the oil pump.
(9)Remove the two transfer tubes from the front of the oil pump. Discard the packings from the two transfer tubes.
(10)Remove and discard packings from the five tubes previously disconnected from pump.

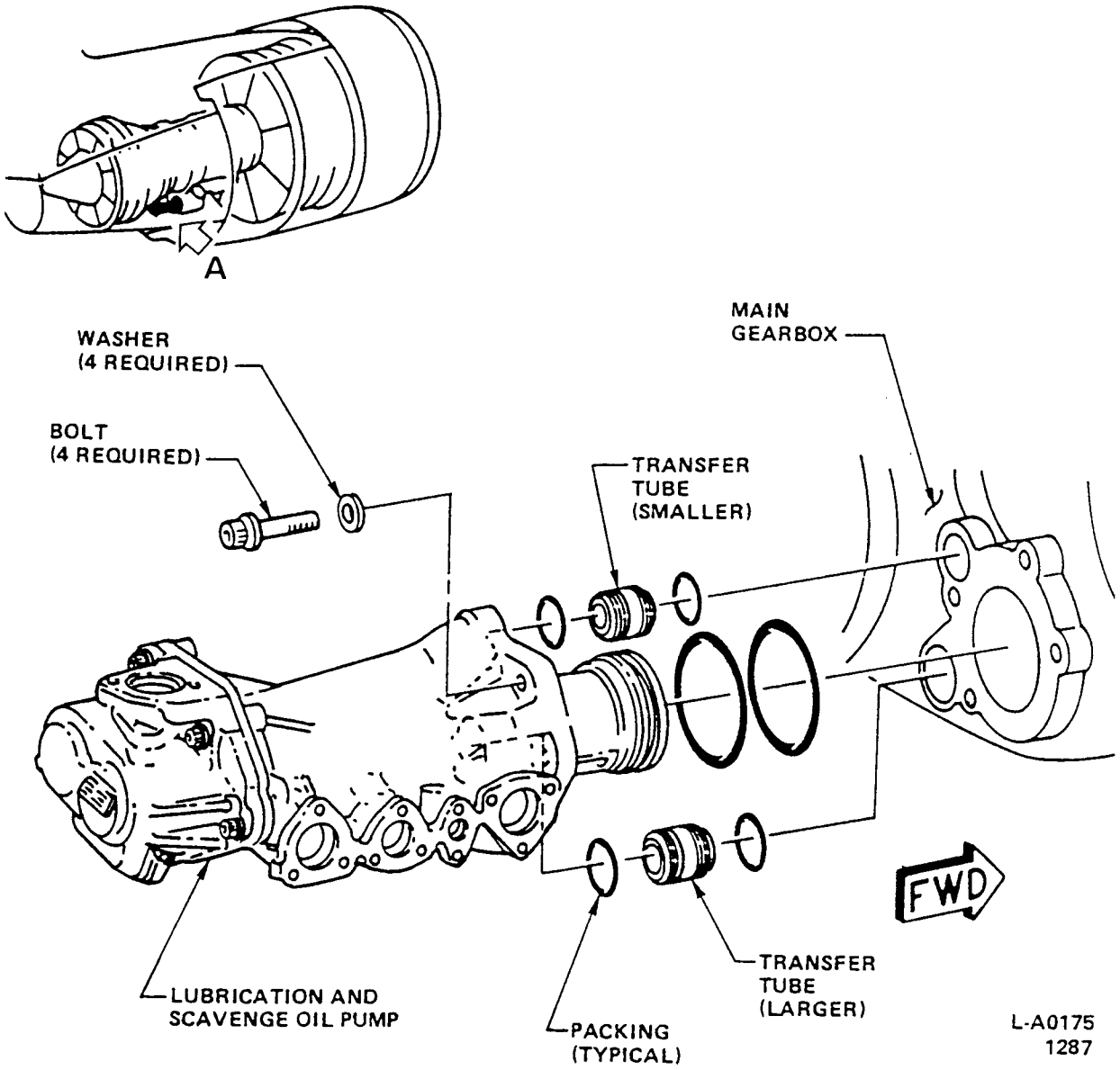
C. Installation (Ref. Fig. 401, 402, 403)
(1)Lubricate preformed packings with Engine Oil (Material No.P03-001), and install packings in grooves of ferrules on tubes as follows :
(a)Install new packing to No. 1, 1.5 and 2 bearing oil scavenge tube assembly (LR03).
(b)Install new packing to angle gearbox scavenge tube assembly (LR01).
(c)Install new packing to No. 4 bearing scavenge tube assembly (LR05).
(d)Install new packing to No. 3 bearing scavenge manifold assembly (LR04).

Pre SB PW4ENG 79-75



BM5 79 21 02 4 KAMA - 02

Lubrication and Scavenge Oil Pump
(Pre SB PW4ENG 79-75) (Sheet 1/2)
Figure 401



BM5 79 21 02 4 KAMJ - 01

Lubrication and Scavenge Oil Pump
(Pre SB PW4ENG 79-75) (Sheet 2/2)
Figure 401

(e)Install packing to main oil filter tube assembly (LP01).
(Ref. Fig. 401)

END Pre SB PW4ENG 79-75

Post SB PW4ENG 79-75

(f)Install packing to main filter oil tube assembly (LP01) and the fluid pressure dampener or (Post SB PW4ENG 79-86) adapter (Ref. Fig. 402, 403).

END SB PW4ENG 79-75

(2)Lubricate four packings with Engine Oil (Material No.P03-001), and install packings to grooves on two transfer tubes. Install transfer tubes to respective ports on lubrication and scavenge oil pump.

(3)Lubricate two packings with Engine Oil (Material No.P03-001), and install packings to grooves on oil pump.

(4)Install lubrication and scavenge oil pump to gearbox aligning transfer tubes with their respective ports.
Secure oil pump with washers and bolts, threads lubricated with
R Antiseize Compound (Material No.P06-054). TORQUE bolts to between 125 and 140 lbf.in. (1.41 and 1.58 m.daN).

Pre SB PW4ENG 79-75

(5)Attach main filter oil tube assembly (LP01) with packing (previously installed) and bracket to top rear port of oil pump with bolts, threads
R lubricated with Antiseize Compound (Material No.P06-054). TORQUE bolts to between 62 and 72 lbf.in. (0.70 and 0.81 m.daN) (Ref. Fig. 401).

(6)Tighten and TORQUE clamp bolt on main filter oil tube bracket to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN) (Ref. Fig. 401).

END Pre PW4ENG 79-75

Post SB PW4ENG 79-75

(7)Attach the fluid pressure dampener or (Post SB PW4ENG 79-86) adapter and the main oil filter hose and tube assembly (LP01) with packing (previously installed) (Ref. Fig. 402, 403).

(a)If applicable, install the dampener or adapter to the top of the main oil pump and hold with bolts, threads lubricated with Engine Oil (Material No.P03-001), to a handtight condition only.

(b)Attach the tube (LP01) to the dampener or adapter, threads lubricated with Engine Oil (Material No.P03-001), to a handtight condition only.

(c)Install bolts, threads lubricated with Engine Oil (Material No.P03-001), nuts and clamps securing tube to gearbox brackets, handtight only.

(d)Install bolts, threads lubricated with Engine Oil (Material No.P03-001), on the tube (LP01) which attaches to the diffuser case bracket.

(e)If applicable, install the loop clamp bracket assembly to the dampener or adapter. Use two retainer bolts and nuts to hold the bracket. TORQUE the bolts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN) (Ref. Fig. 402) (Sheets 5 and 6).

(f)TORQUE all the clamp bolts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(g)TORQUE the bolts that hold the dampener or adapter to the top of the main oil pump to between 62 and 72 lbf.in. (0.71 and 0.81 m.daN).

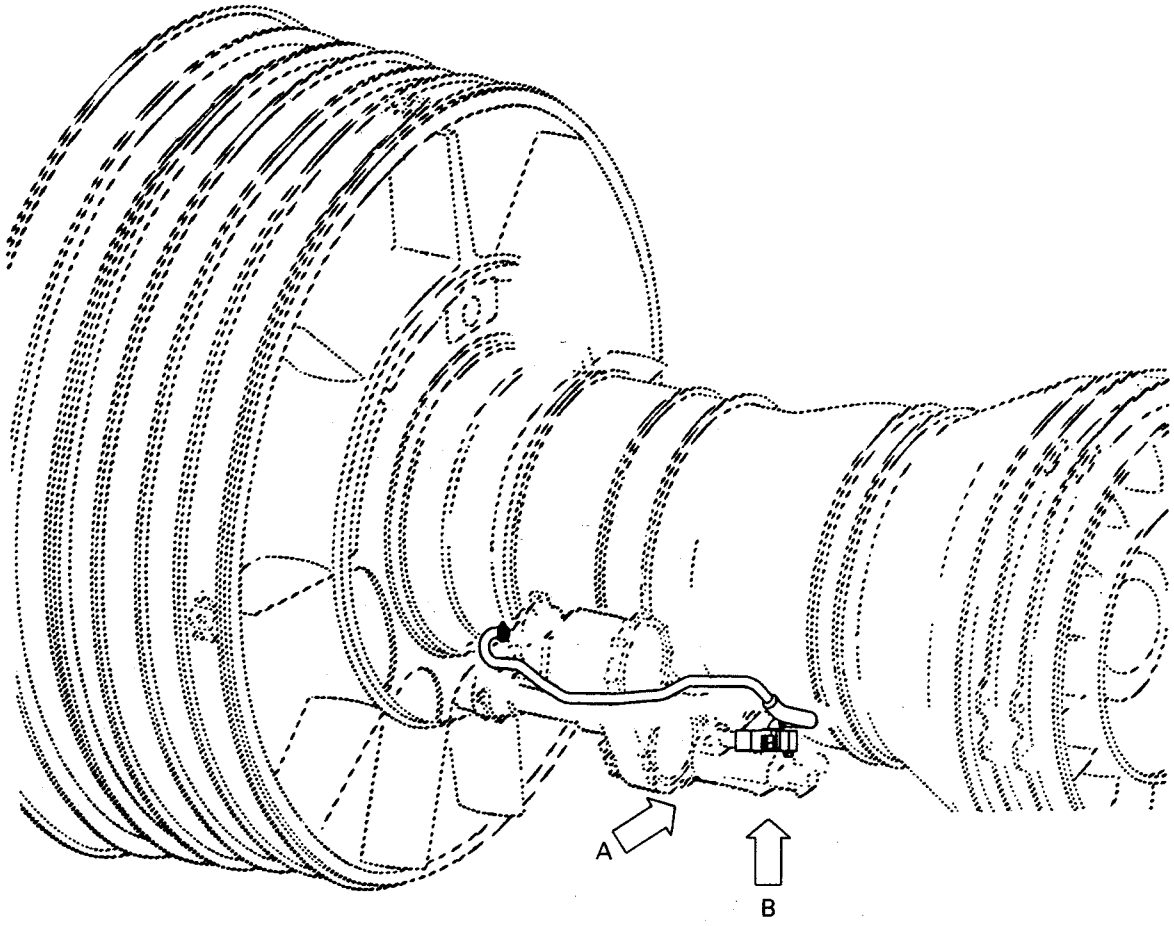
(h)TORQUE the bolts that hold the tube (LP01) to the dampener or adapter to between 62 and 72 lbf.in. (0.71 and 0.81 m.daN).

(i)TORQUE the bolts securing the tube (LP01) to the diffuser case bracket to between 65 and 75 lbf.in. (0.73 and 0.85 m.daN).

END SB PW4ENG 79-75

(8)Starting at right front of oil pump and working rearward, attach four
R scavenge tubes (with packings previously installed) using Antiseize
R Compound (Material No.P06-054) lubricated bolts as follows :
(a)Attach No. 1, 1.5 and 2 bearing oil scavenge tube assembly (LR03).
(b)Attach angle gearbox scavenge tube assembly (LR01).
(c)Attach No. 4 bearing scavenge tube assembly (LR05).
(d)Attach No. 3 bearing scavenge manifold assembly (LR04).
(9)TORQUE all bolts securing four scavenge tubes to between 62 and 72 lbf. in. (0.70 and 0.81 m.daN).
(10)Tighten and TORQUE all previously loosened clamp bolts on tubes to between 36 and 40 lbf. in. (0.40 and 0.45 m.daN).
(11)Connect electrical harness connector to pump, tighten connector finger tight plus one eighth turn. Wirelock connector.

D. Close-Up
(1)Install the magnetic chip collector assemblies in the main gearbox and oil tank (Ref. 79-22-03, P. Block 401).
(2)Service oil system (Ref. 12-13-70, P. Block 1).
(3)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(4)Close thrust reverser and fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(5)Test engine per repair Test Reference Table (Ref. 71-00-00, P. Block 501).

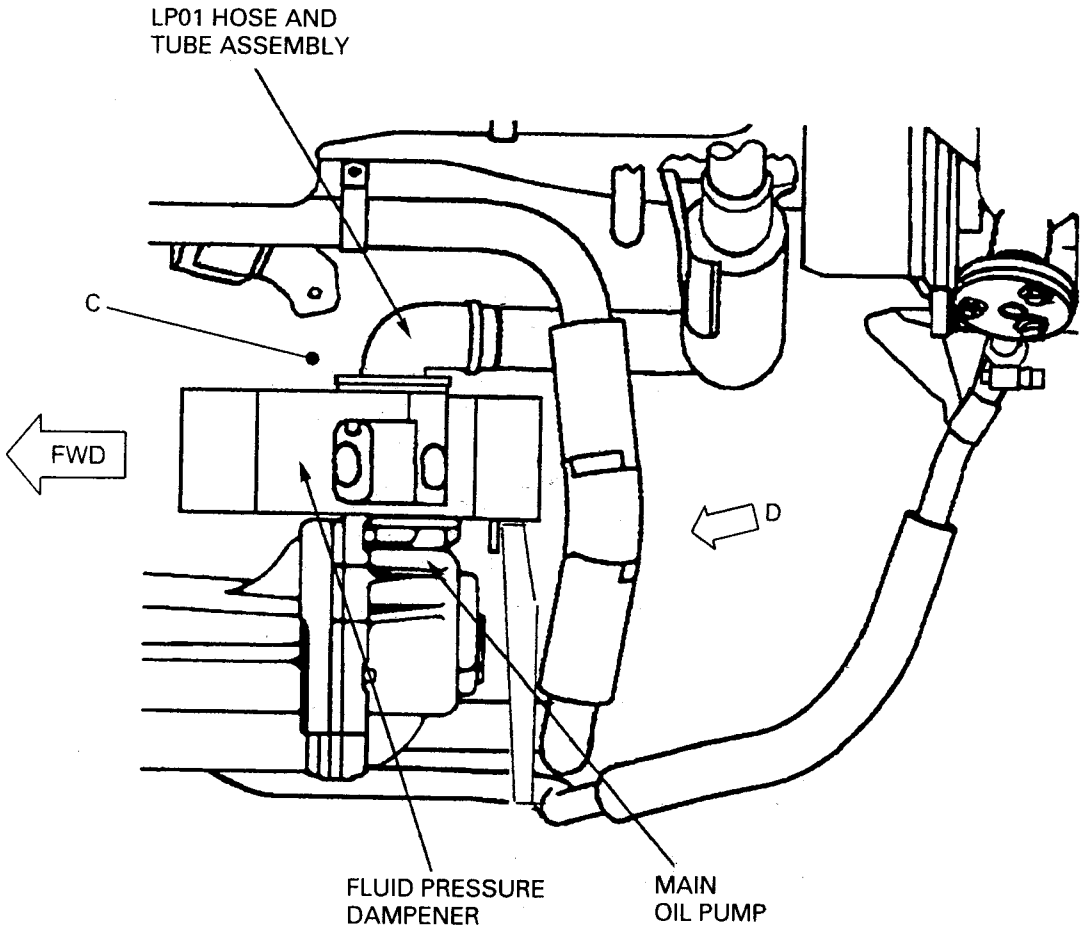


ENGINE LEFT SIDE VIEW

L-B2502 (0000)

BM5 79 21 02 4 KBMA 00

Lubrication And Scavenge Oil Pump
(Post SB PW4ENG 79-75) (Sheet 1/6)
Figure 402

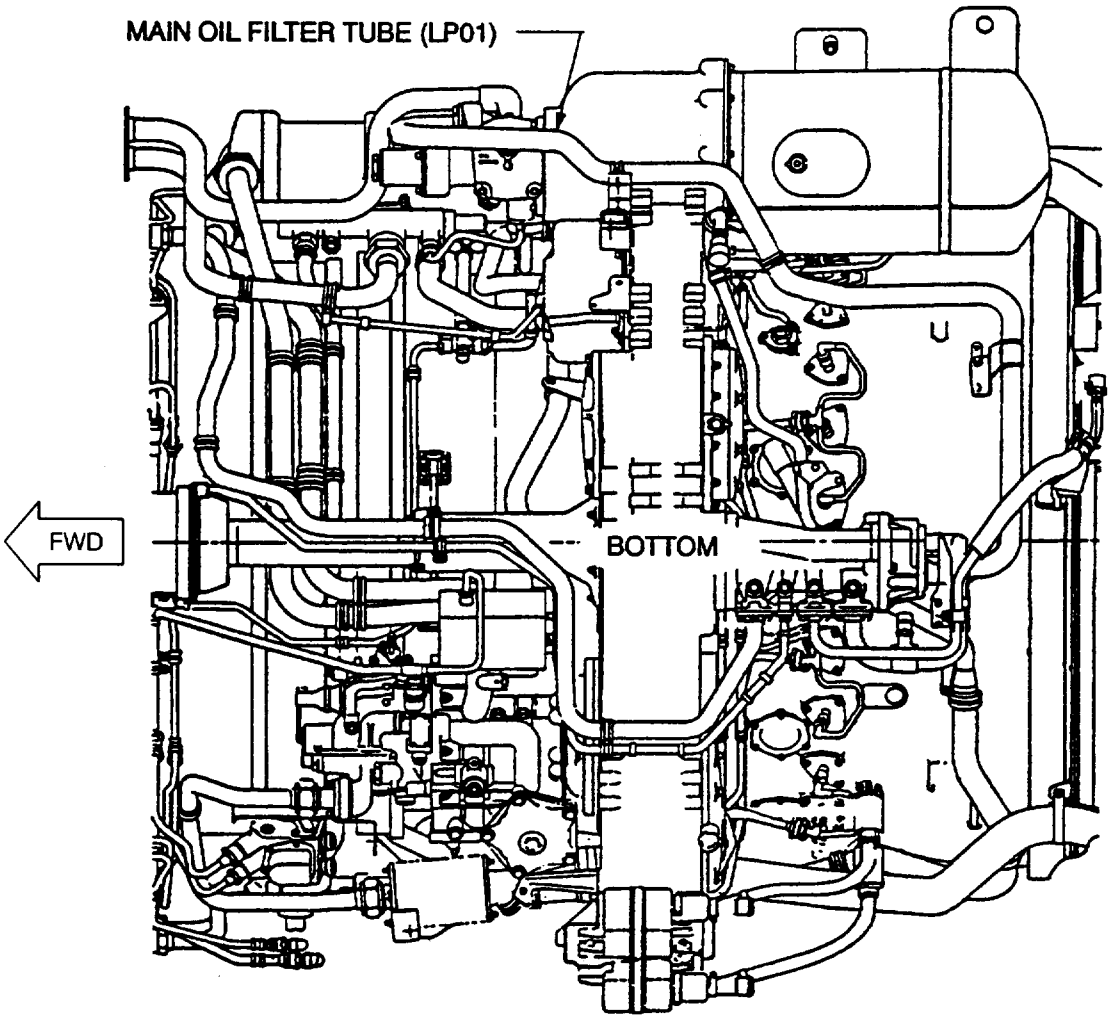


VIEW A

L-B2503 (0000)

BM5 79 21 02 4 KBMB 00

Lubrication And Scavenge Oil Pump
(Post SB PW4ENG 79-75) (Sheet 2/6)
Figure 402

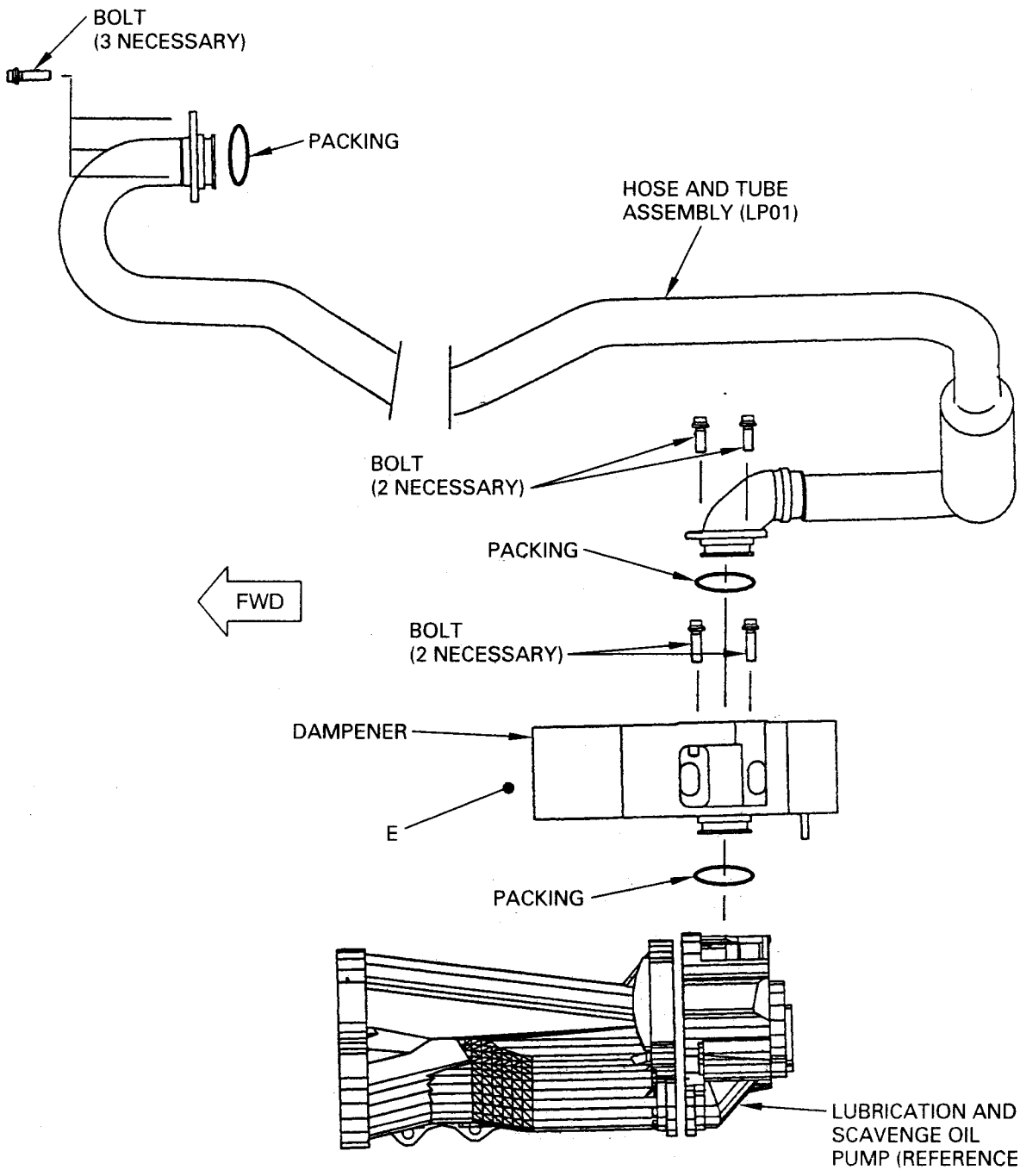


VIEW B
(ENGINE BOTTOM VIEW)

L-B6566 (0698)

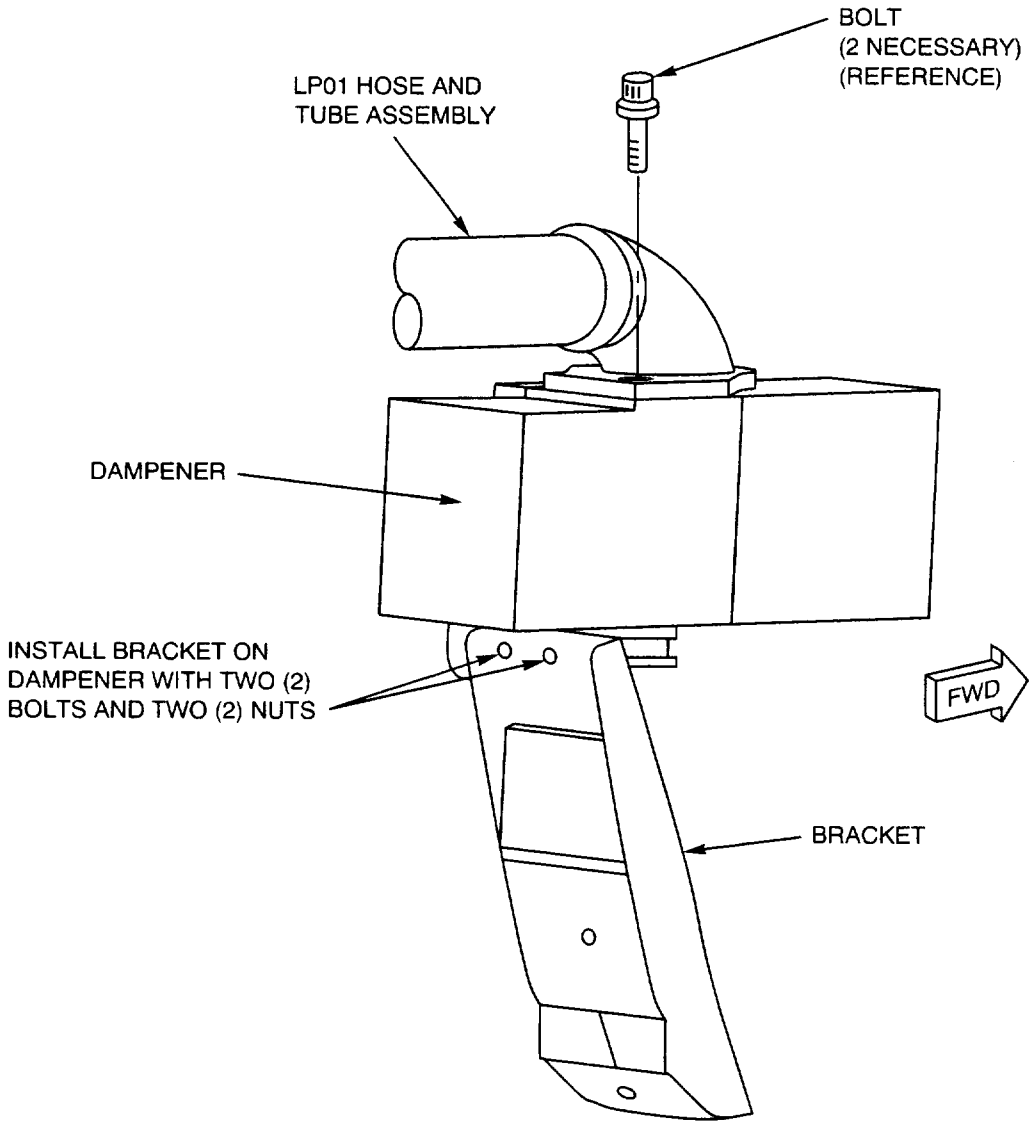
BM5 79 21 02 4 KBMC 01

Lubrication And Scavenge Oil Pump
(Post SB PW4ENG 79-75) (Sheet 3/6)
Figure 402



BM5 79 21 02 4 KBMD 00

Lubrication And Scavenge Oil Pump
(Post SB PW4ENG 79-75) (Sheet 4/6)
Figure 402

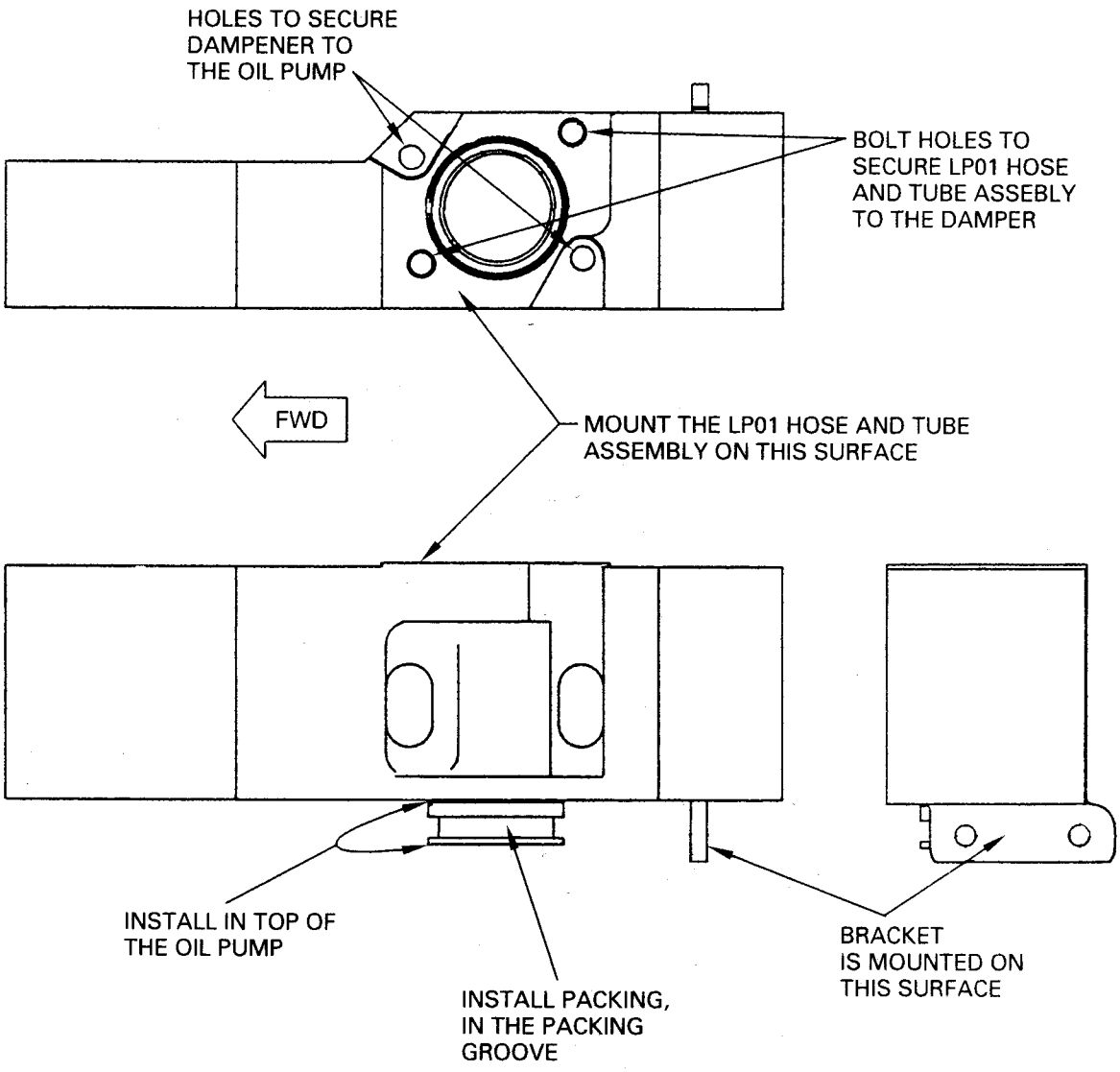


VIEW D
(SHOWS NEW CONFIGURATION
WITH OIL PUMP OMITTED)

L-B2506 (1297)
PW V

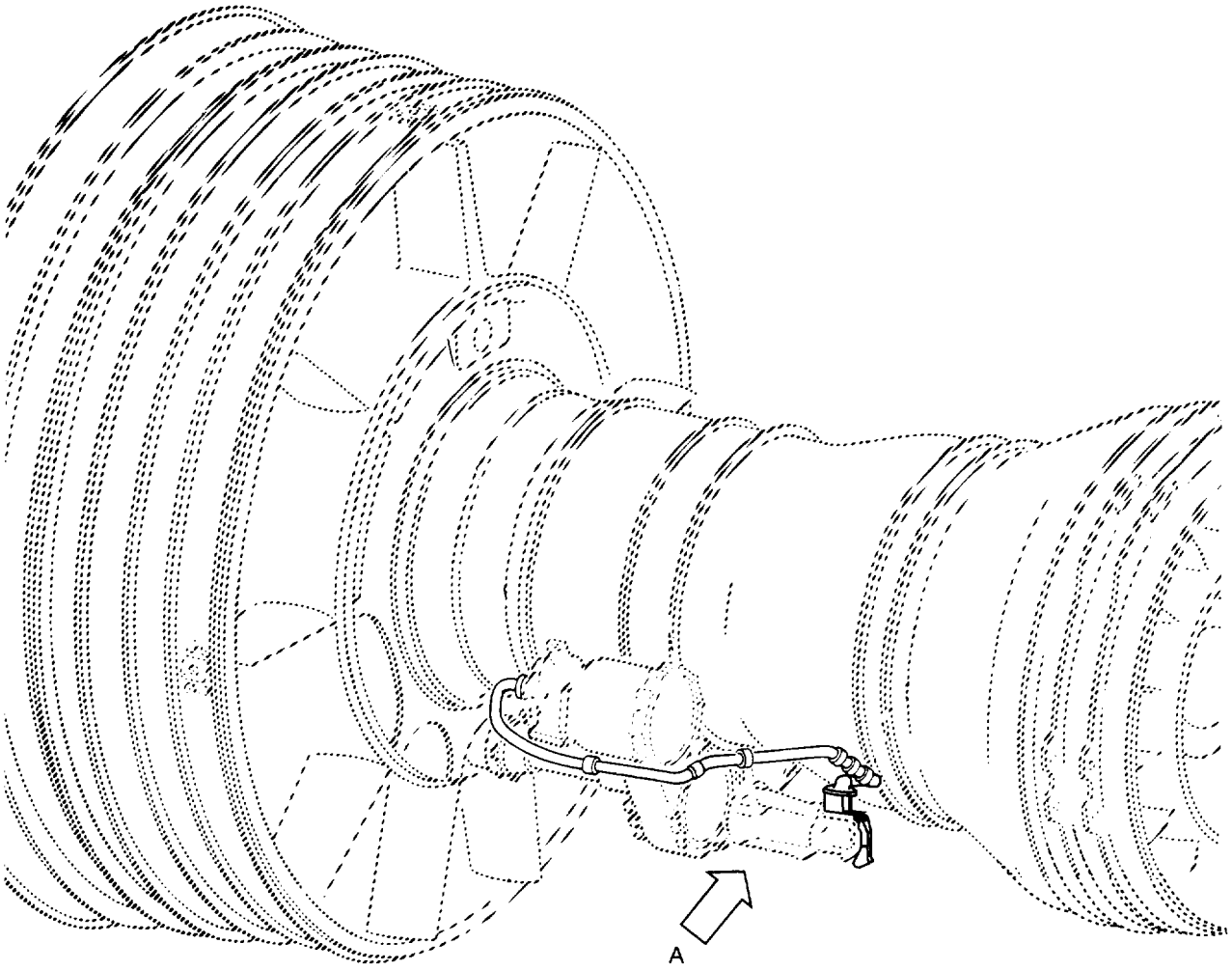
BM5 79 21 02 4 KBME 01

Lubrication And Scavenge Oil Pump
(Post SB PW4ENG 79-75) (Sheet 5/6)
Figure 402


HOLES TO SECURE DAMPENER TO THE OIL PUMP
BOLT HOLES TO SECURE LP01 HOSE AND TUBE ASSEBLY TO THE DAMPER
FWD
MOUNT THE LP01 HOSE AND TUBE ASSEMBLY ON THIS SURFACE
INSTALL IN TOP OF THE OIL PUMP
INSTALL PACKING, IN THE PACKING GROOVE
BRACKET IS MOUNTED ON THIS SURFACE
VIEW E
L-B2507 (0000)

BM5 79 21 02 4 KBMF 00

Lubrication And Scavenge Oil Pump
(Post SB PW4ENG 79-75) (Sheet 6/6)
Figure 402

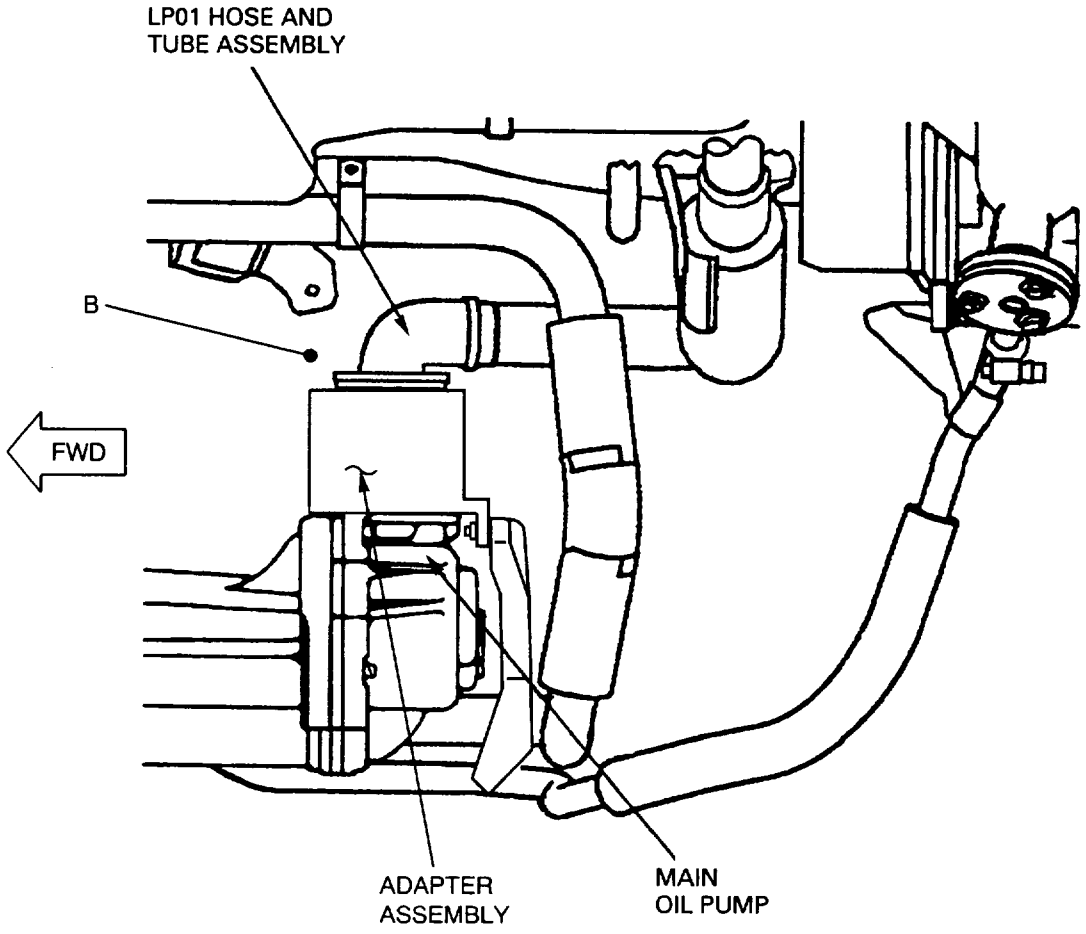


ENGINE LEFT SIDE VIEW

BM5 79 21 02 4 KCMA 00

L-B6567 (0698)

Lubrication And Scavenge Oil Pump
(Post SB PW4ENG 79-86) (Sheet 1/3)
Figure 403

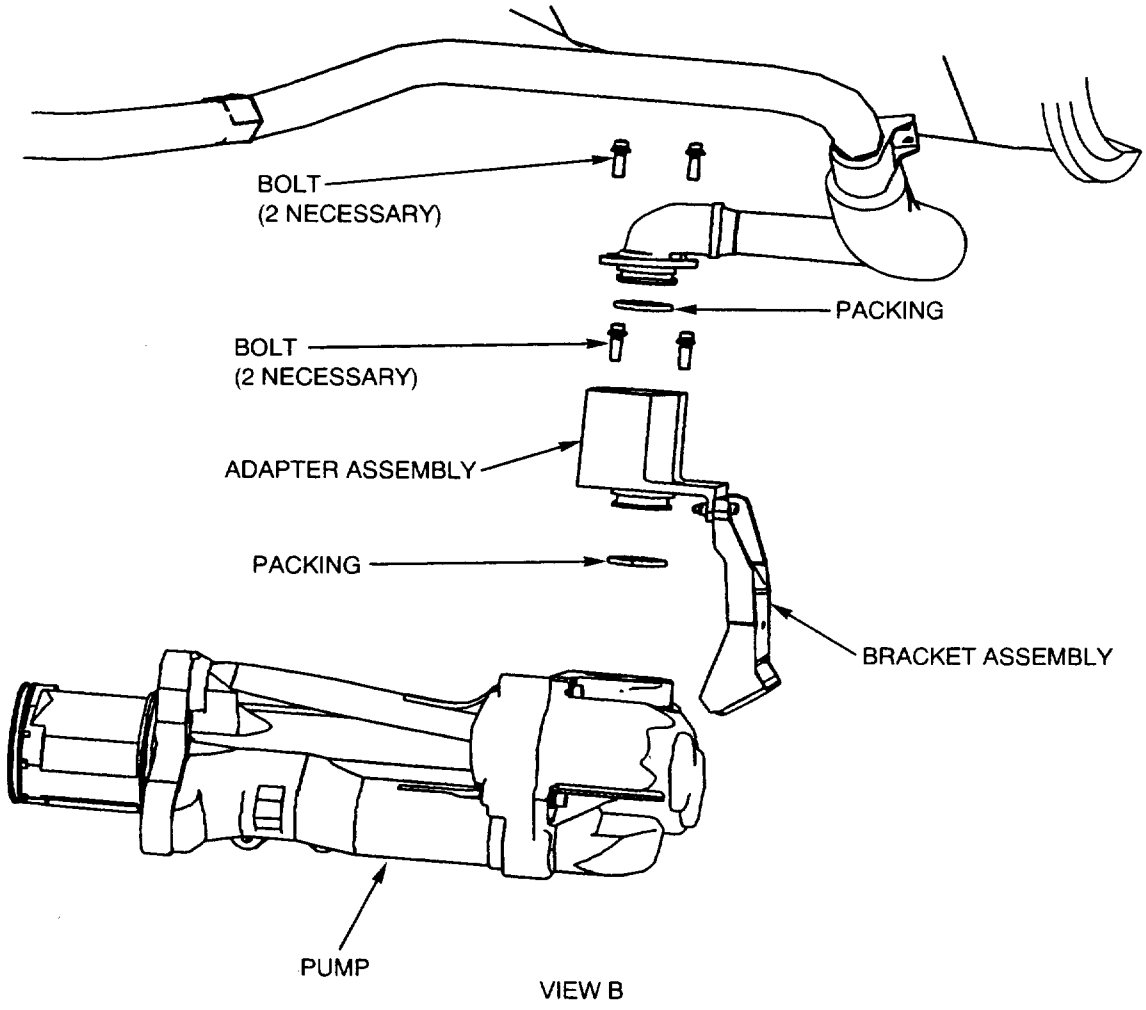


VIEW A

BM5 79 21 02 4 KCMJ 00

L-B6568 (0698)

Lubrication And Scavenge Oil Pump
(Post SB PW4ENG 79-86) (Sheet 2/3)
Figure 403



BM5 79 21 02 4 KCMS 00

L-B6569 (0698)

Lubrication And Scavenge Oil Pump
(Post SB PW4ENG 79-86) (Sheet 3/3)
Figure 403

OIL FILTER - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Container Minimum Capacity of 5 USgal (19 l)
C.	Packings
D.	Filter Element
E.	Torque Wrench
F.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
G. Material No.P03-001	Oils (Ref. 70-00-00)
H. Material No.P05-289	Special Materials (Ref. 70-00-00)
I. Material No.P05-291	Special Materials (Ref. 70-00-00)
J. Material No.P05-292	Special Materials (Ref. 70-00-00)
Referenced Procedures	
- 12-13-79, P. Block 1	Engine Lubricating Oil
- 71-13-00, P. Block 301	Cowl Doors
- 71-00-00, P. Block 501	Power Plant - General
- 72-65-11, P. Block 401	Main Oil Filter Housing

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401, 403, 404)
WARNING : PRESSURE CAN SUDDENLY FORCE OUT HOT OIL ONTO YOU. HOT OIL CAN CAUSE BURNS.
BEFORE YOU DRAIN THE OIL FROM THE MAIN OIL FILTER HOUSING, PERMIT PRESSURE TO BLEED FROM THE OIL SYSTEM. WAIT A MINIMUM OF FIVE MINUTES AFTER THE ENGINE STOPS.

Pre SB PW4ENG 72-524
(1)Remove the main oil filter details from the main oil filter housing as follows (Ref. Fig. 401).
(a)Drain oil from main oil filter housing assembly.
1 Remove the plug (12), and insert (10) from bottom port in main oil strainer cover (15). Hold insert in place with wrench on flats while removing plug. Discard packings (9) and (11).
NOTE : Be prepared to catch oil in a container with a minimum capacity of 5 USgal (19 l).
WARNING : FILTER COVER IS UNDER SPRING PRESSURE. EXERCISE CARE TO PREVENT PERSONAL INJURY DURING DISASSEMBLY.
(b)Remove four bolts (13) and washers (14) securing main oil strainer cover (15) to main oil filter housing (3). Remove cover and filter element (4) from housing. Remove filter element. Discard packing (8).
(c)Remove spring (5) from cover. Remove screw (6) securing keywasher

(7) to cover. Remove keywasher and discard.

END Pre SB PW4ENG 72-524

Post PW4ENG 72-524 and Pre SB PW4ENG 79-79

(2)Remove the main oil filter details from the main oil filter housing as follows (Ref. Fig. 403).

(a)Drain oil from main oil filter housing assembly.

1 Remove the plug (12), and insert (10) from the bottom port in main oil strainer cover (15). Hold insert in place with wrench on flats while removing plug. Discard packings (9) and (11).

NOTE : Be prepared to catch oil in a container with a minimum capacity of 5 USgal (19 l).

WARNING : FILTER COVER IS UNDER SPRING PRESSURE. EXERCISE CARE TO PREVENT PERSONAL INJURY DURING DISASSEMBLY.

(b)Remove the four nuts (29) or (30) and the washers (14) that secure the main oil strainer cover (15) to main oil filter housing (3). Remove cover and filter element (4) from housing. Remove filter element. Discard packing (8). Discard the four self-locking nuts (29) and keep the nuts (30) with the wire holes.

(c)Remove spring (5) from cover. Remove screw (6) securing keywasher (7) to cover. Remove keywasher and discard.

(d)Make a check of the studs installed in the main oil filter housing. If the studs are satisfactory, the cover can be installed again, if the studs are not serviceable remove and replace the main oil filter housing (Ref. 72-65-11, P. Block 401).

(Ref. Fig. 405)

END SB PW4ENG 72-524 and END Pre SB PW4ENG 79-79

Post SB PW4ENG 72-524 and Post SB PW4ENG 79-79

(3)Remove the main oil filter details from the main oil filter housing as follows (Ref. Fig. 404).

(a)Drain oil from main oil filter housing assembly.

1 Remove the plug (12), and insert (10) from the bottom port in main oil strainer cover (21). Hold insert in place with wrench on flats while removing plug. Discard packings (9) and (11).

NOTE : Be prepared to catch oil in a container with a minimum capacity of 5 USgal (19 l).

WARNING : FILTER COVER IS UNDER SPRING PRESSURE. EXERCISE CARE TO PREVENT PERSONAL INJURY DURING DISASSEMBLY.

(b)Remove the four nuts (29) or (30) and the washers (14) that secure the main oil strainer cover (21) to the main oil filter housing (3). Remove the cover and the filter element (4) from the housing. Remove the filter element. Discard the packing (8). Discard the four self-locking nuts (29) and keep the nuts (30) with the wire holes.

(c)Remove the spring (5) from the cover (21). Remove the two screws (22) and the two washers (20) securing the spring retainer (23) to the cover (21).

(d)Make a check of the studs installed in the main oil filter housing. If the studs are satisfactory, the cover can be installed again, if the studs are not serviceable remove and replace the main oil filter housing (Ref. 72-65-11, P. Block 401).

(Ref. Fig. 405)

END SB PW4ENG 72-524 and END SB PW4ENG 79-79

R **ON A/C 101-104,

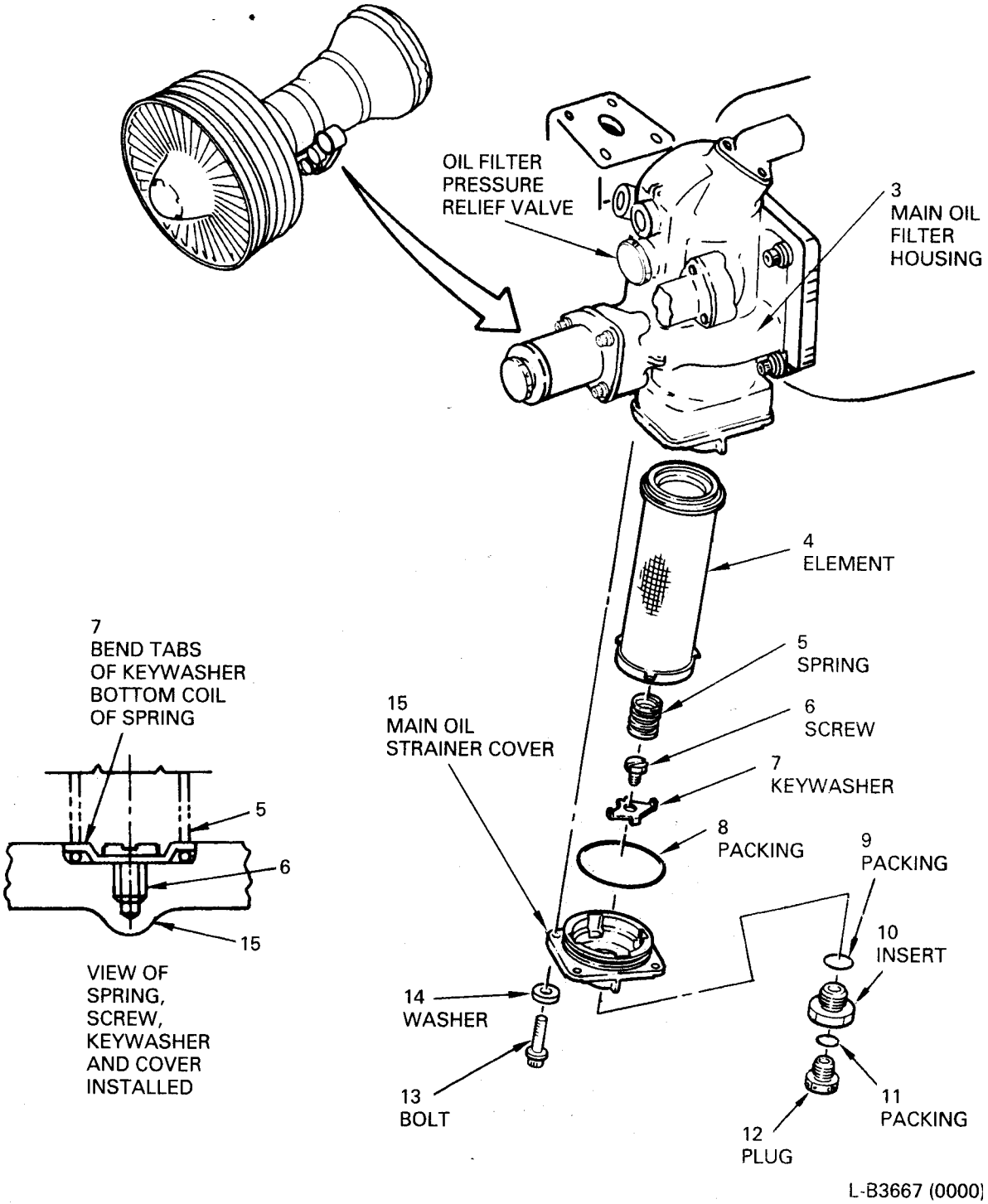
R Post SB 72-2030 For A/C 101-104,

B. Removal (Ref. Fig. 402)
(1)Remove the main oil filter details from the main oil filter housing as follows (Ref. Fig. 402).
(a)Drain oil from main oil filter housing assembly.
1 Remove the plug (12) from the bottom port in main oil strainer cover (42). Discard packing (11).
NOTE : Be prepared to catch oil in a container with a minimum capacity of 5 USgal (19 l).
WARNING : FILTER COVER IS UNDER SPRING PRESSURE. EXERCISE CARE TO PREVENT PERSONAL INJURY DURING DISASSEMBLY.
(b)Remove four nuts (29) and washers (14) securing main oil strainer cover (42) to main oil filter housing (3). Remove cover and filter element (39) from housing. Remove filter element. Discard packing (8). Discard the four self-locking nuts (29).
(c)Make a check of the studs installed in the main oil filter housing. If the studs are satisfactory, the cover can be installed again, if the studs are not serviceable remove and replace the main oil filter housing (Ref. 72-65-11, P. Block 401).
(Ref. Fig. 405)

(2)Install protective closures.

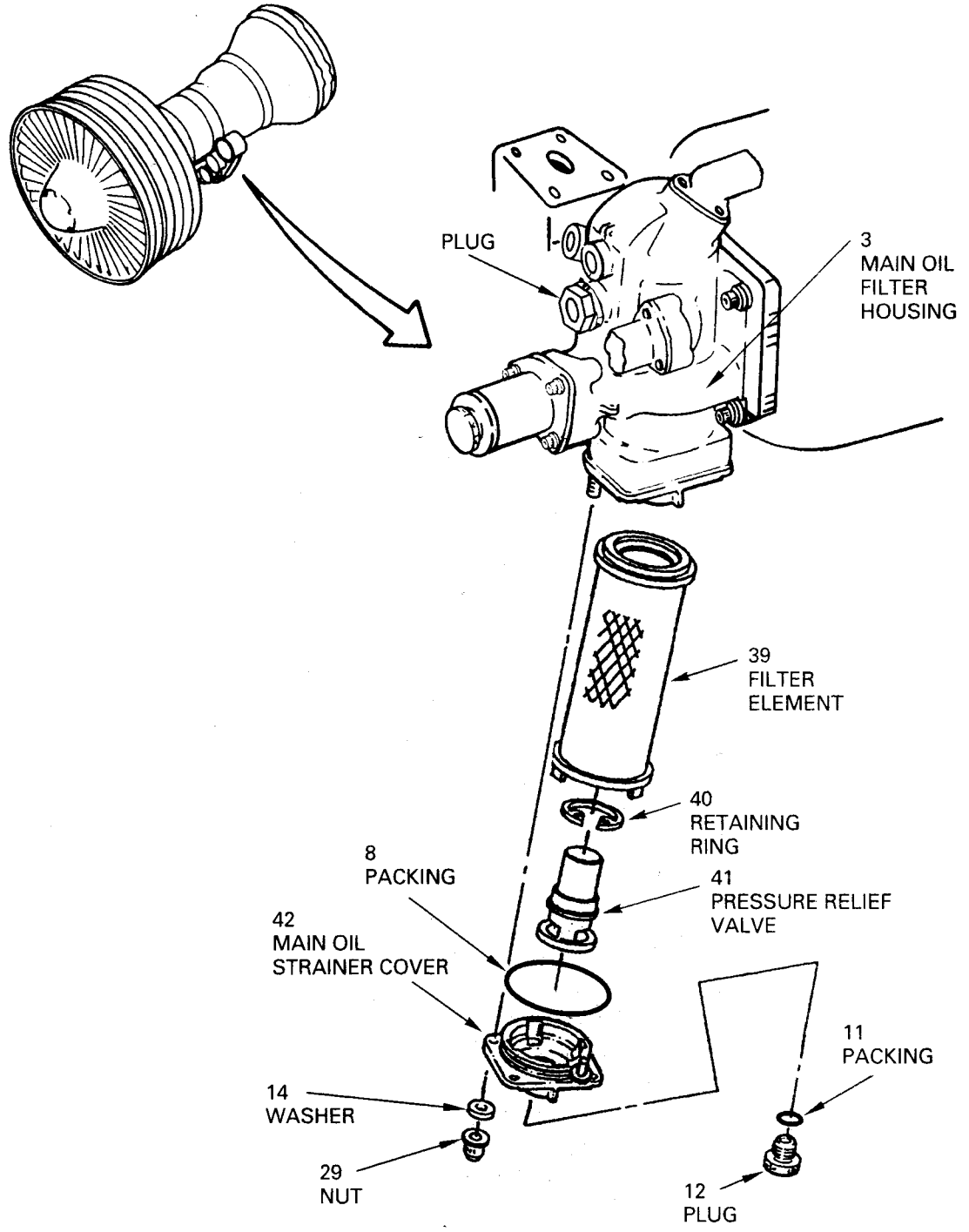
**ON A/C 101-200,

C. Installation (Ref. Fig. 401, 403, 404)
(1)Remove protective closures and check oil filter cavity for foreign material and remove any that is found.
Pre SB PW4ENG 72-524
(2)Install the main oil filter details in the main oil filter housing assembly (3) as follows (Ref. Fig. 401).
(a)Align bolt hole and position keywasher (7) in center of cover (15) with tab of keywasher in mating hole in cover. Secure key washer with screw (6), lubricated with Engine Oil (Material No.P03-001). TORQUE screw to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(b)Install spring (5) on keywasher (7). Bend tabs of washer out between coils of spring.
(c)Install new packing (8), lubricated with Engine Oil (Material No.P03-001), into groove in Outside Diameter (OD) of main oil strainer cover (15).
(d)Install the filter element (4), into opening in bottom of cover (15). Align the bolt holes and install cover with filter element into main oil filter housing (3).
NOTE : For this build configuration, the removable plug in the outboard



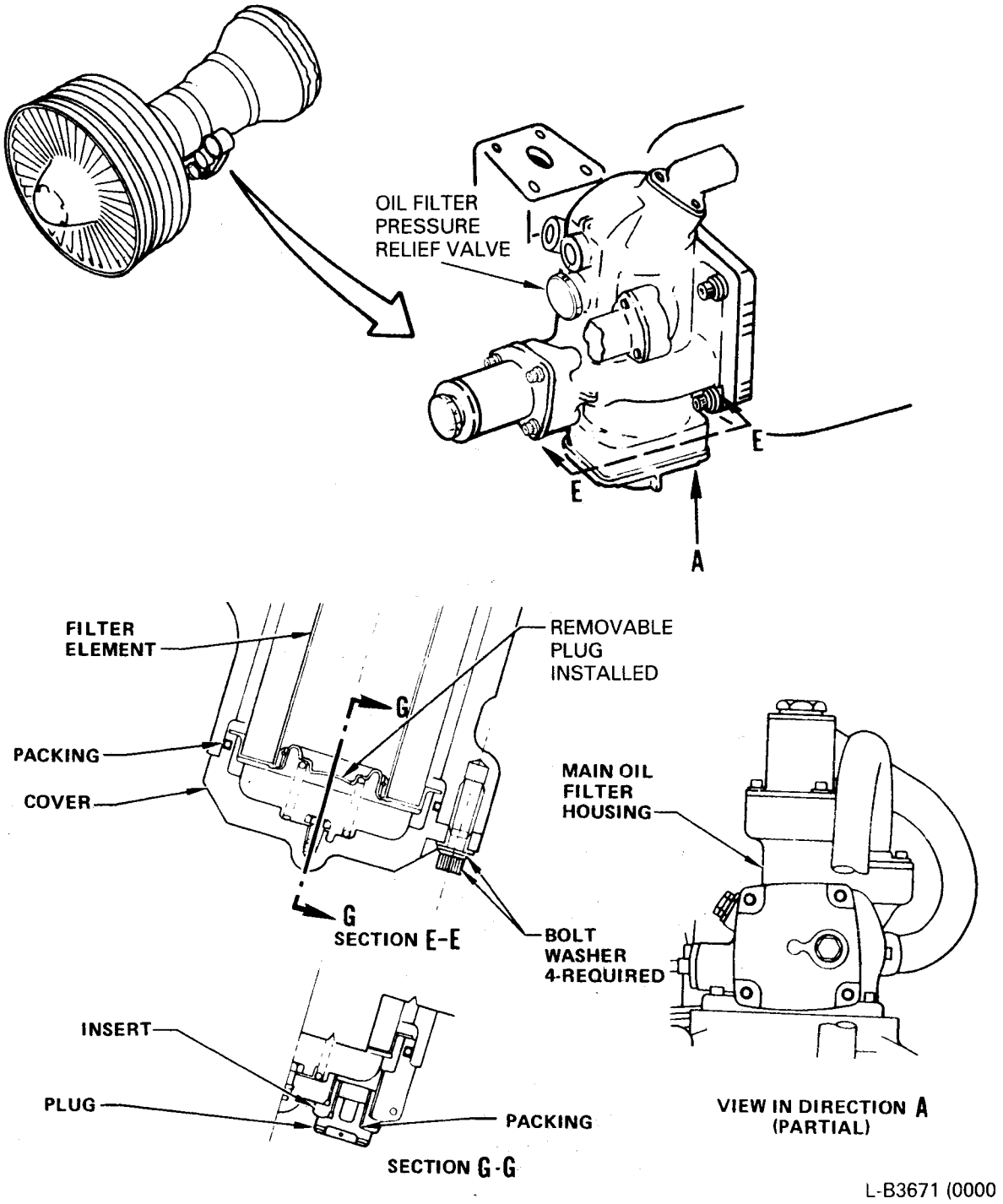
BM5 79 21 03 4 KAMA 00

Main Oil Filter
(Pre SB PW4ENG 72-524) (Sheet 1/2)
Figure 401



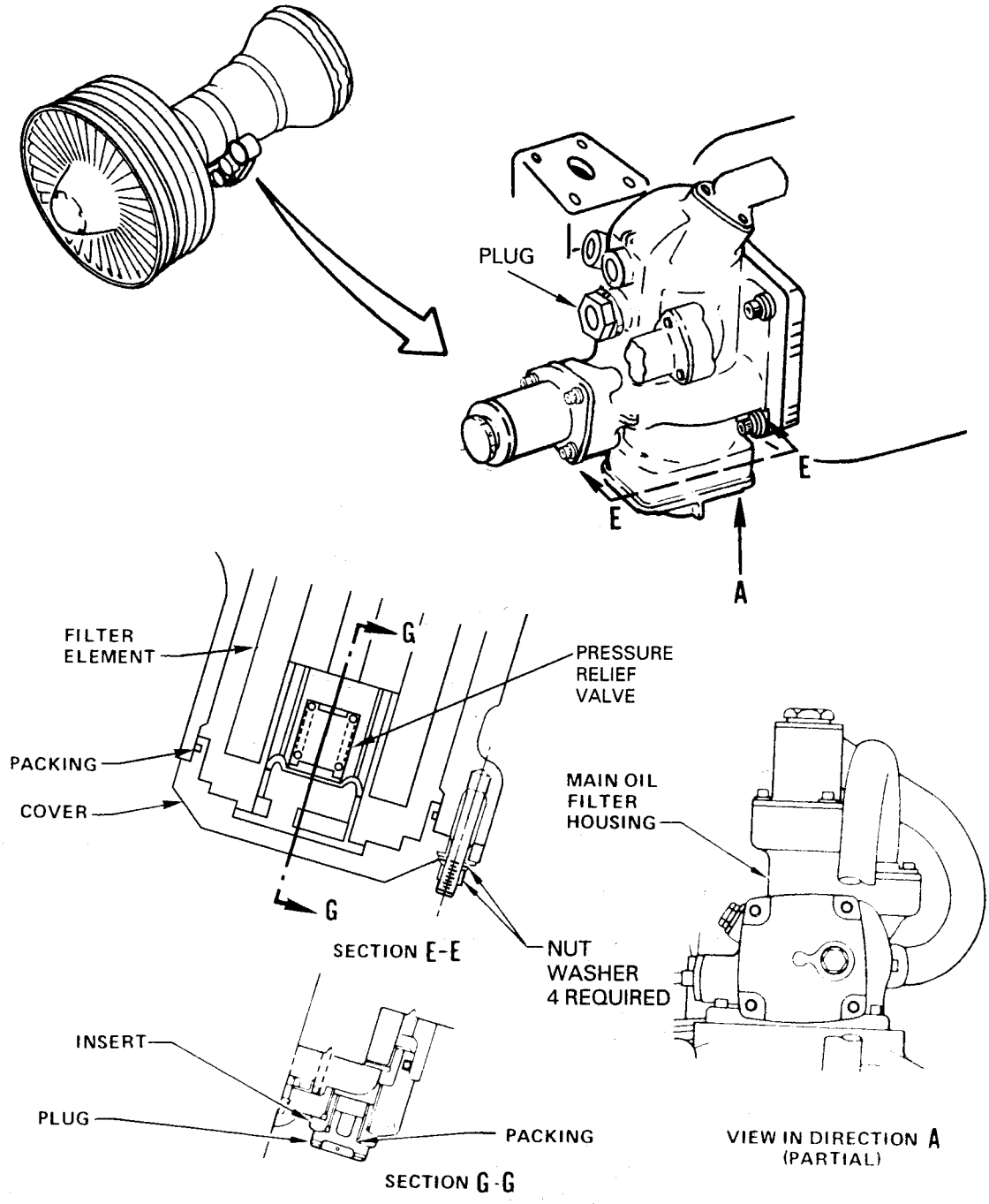
BM5 79 21 03 4 KANA 00

Main Oil Filter (Sheet 1/2)
Figure 402



BM5 79 21 03 4 KAMJ 00

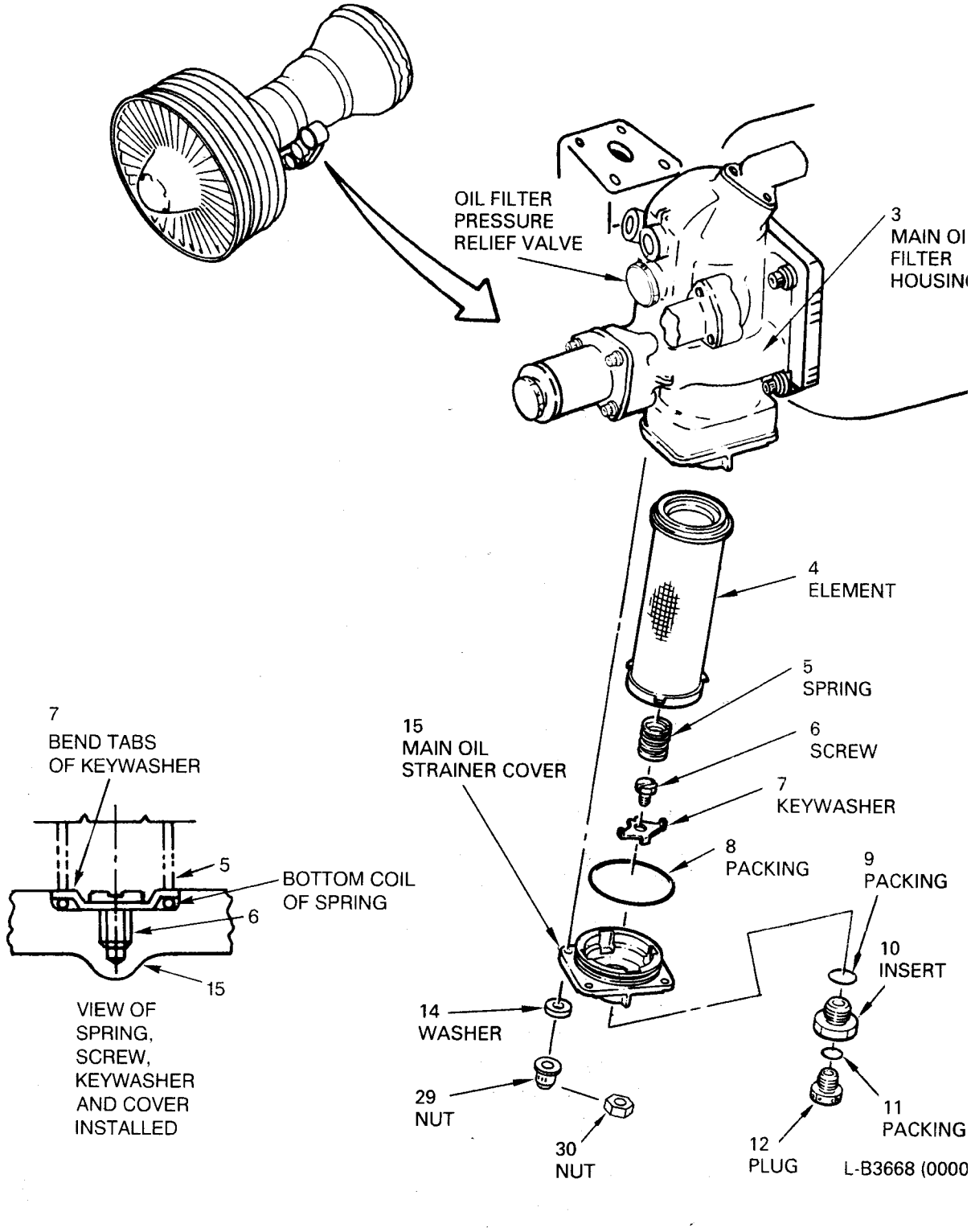
Main Oil Filter
(Pre SB PW4ENG 72-524) (Sheet 2/2)
Figure 401



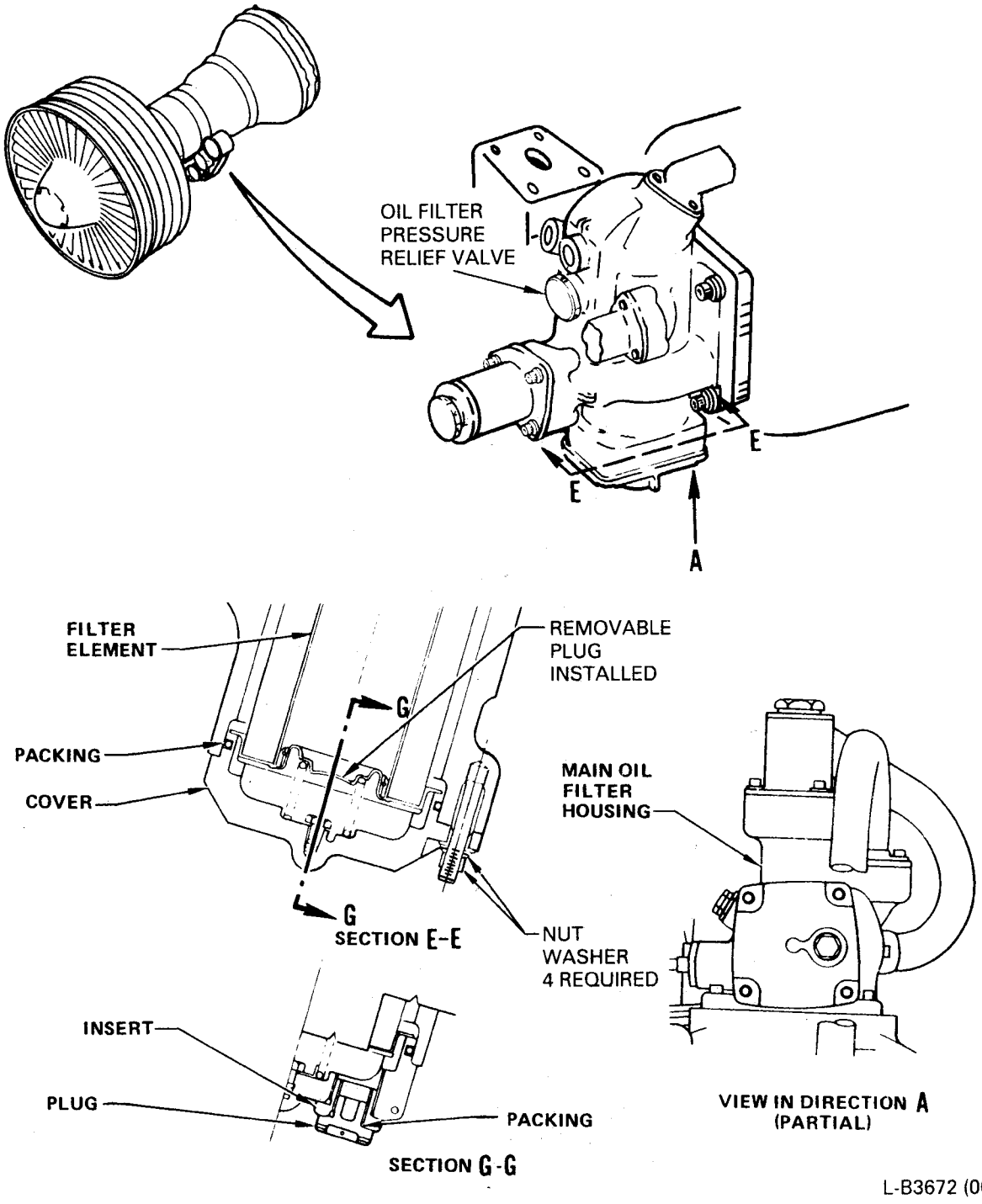
L-B3674 (0000

BM5 79 21 03 4 KANJ 00

Main Oil Filter (Sheet 2/2)
Figure 402

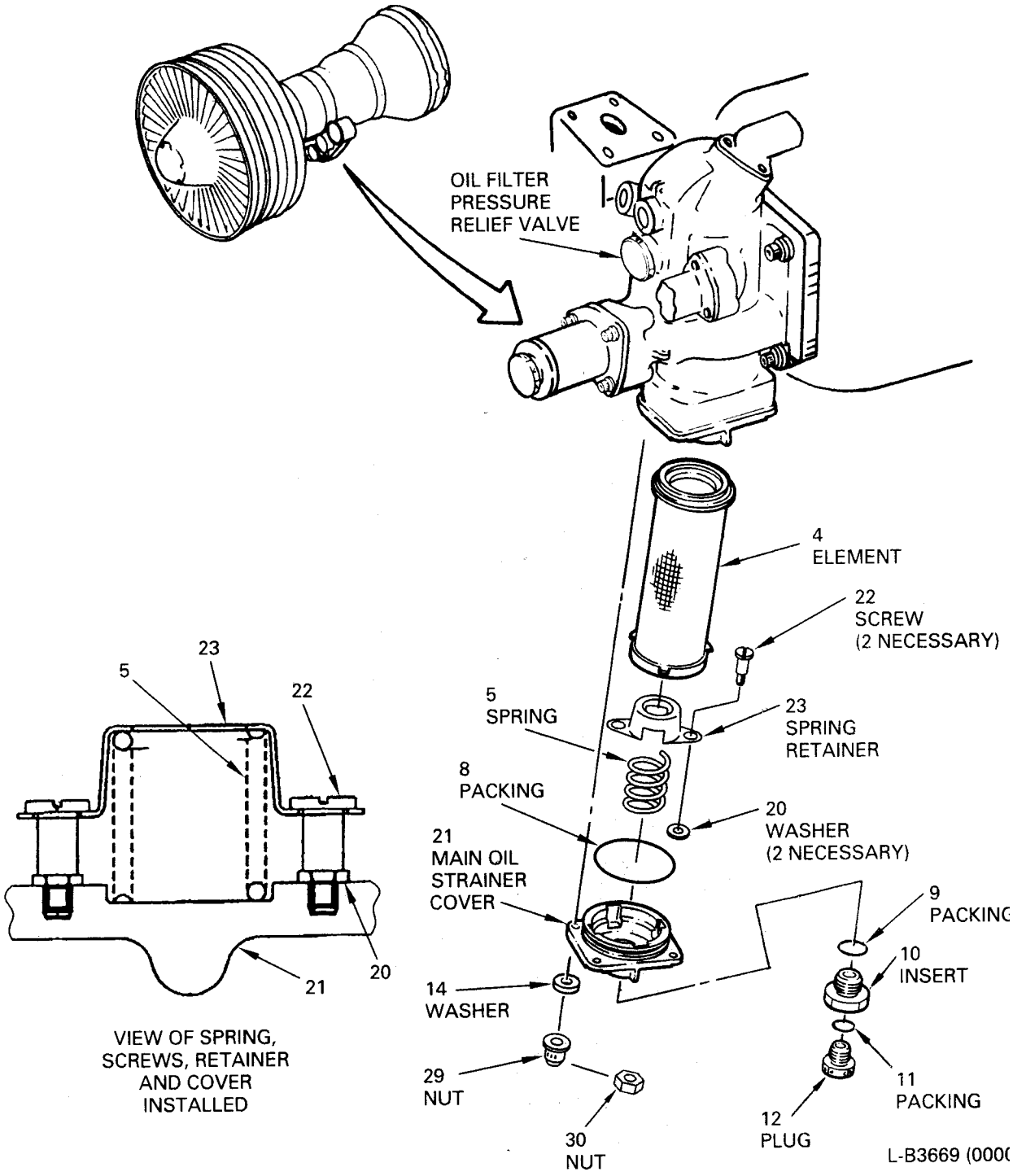


Main Oil Filter
(Post SB PW4ENG 72-524 and Pre PW4ENG 79-79) (Sheet 1/2)
Figure 403

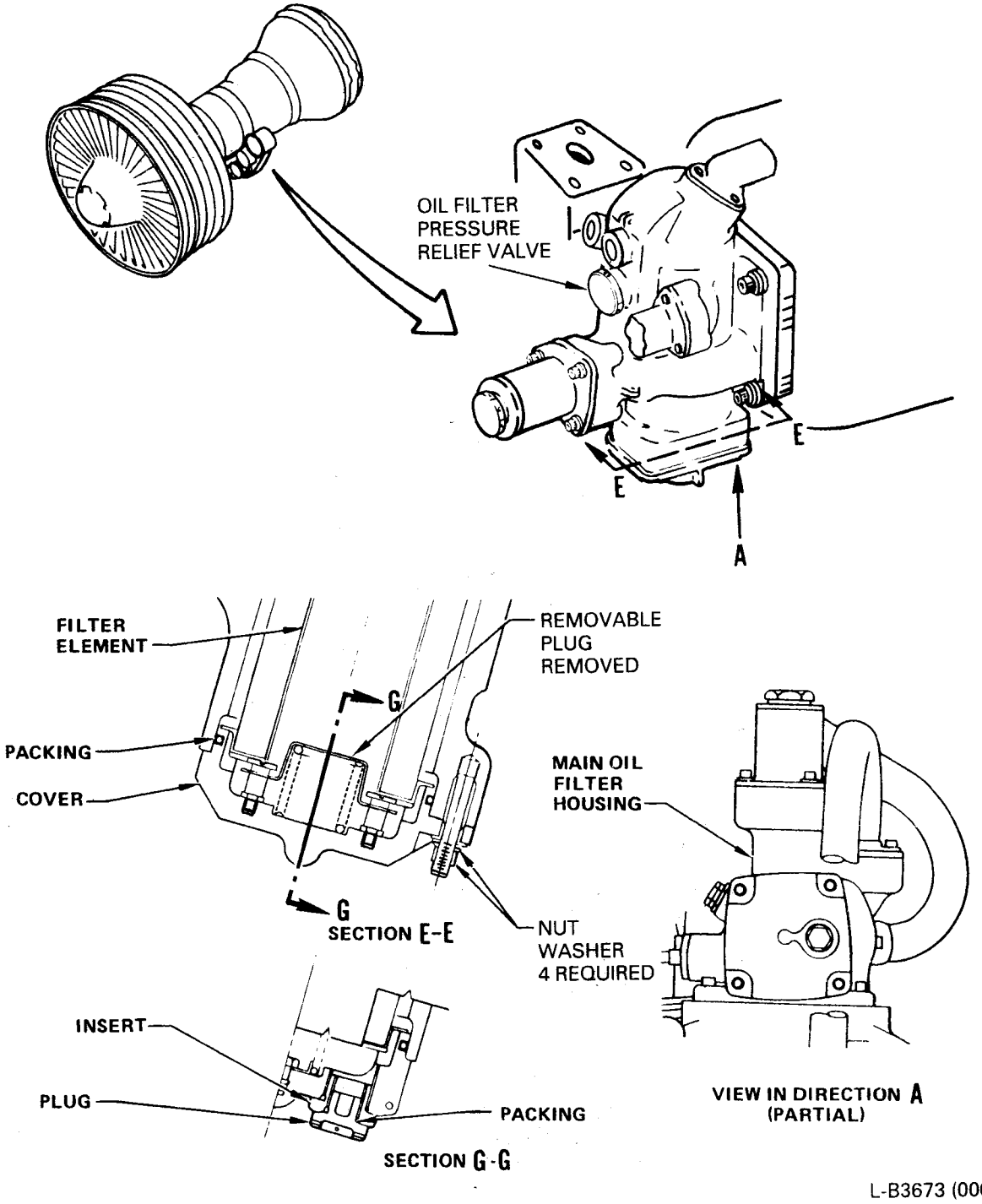


BM5 79 21 03 4 KBMJ 00

Main Oil Filter
(Post SB PW4ENG 72-524 and Pre PW4ENG 79-79) (Sheet 2/2)
Figure 403

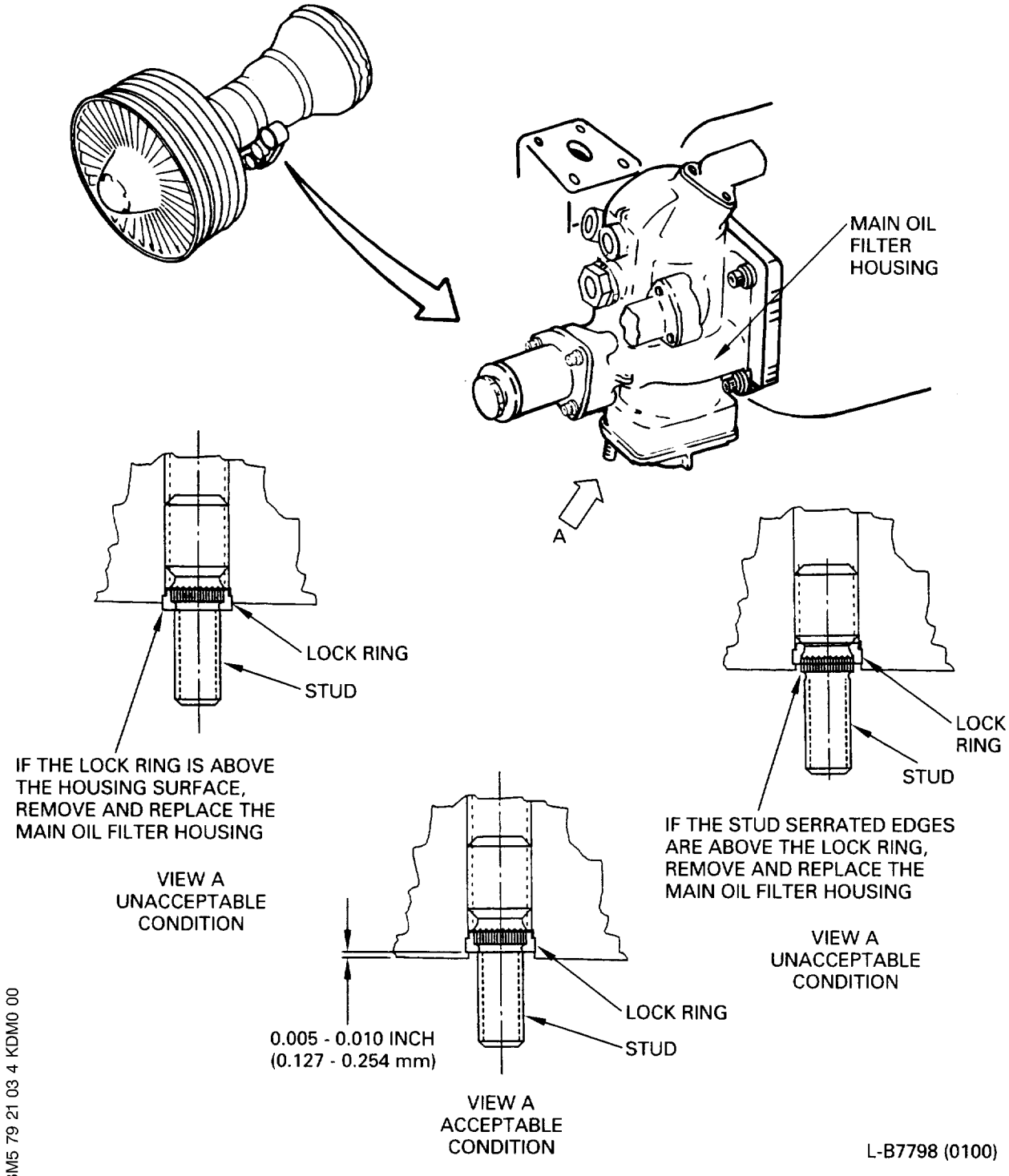


Main Oil Filter
(Post SB PW4ENG 72-524 and Post PW4ENG 79-79) (Sheet 1/2)
Figure 404



BM5 79 21 03 4 KCMJ 00

Main Oil Filter
(Post SB PW4ENG 72-524 and Post PW4ENG 79-79) (Sheet 2/2)
Figure 404


MAIN OIL FILTER HOUSING
A
LOCK RING
STUD
IF THE LOCK RING IS ABOVE THE HOUSING SURFACE, REMOVE AND REPLACE THE MAIN OIL FILTER HOUSING
VIEW A UNACCEPTABLE CONDITION
LOCK RING
STUD
IF THE STUD SERRATED EDGES ARE ABOVE THE LOCK RING, REMOVE AND REPLACE THE MAIN OIL FILTER HOUSING
VIEW A UNACCEPTABLE CONDITION
0.005 - 0.010 INCH (0.127 - 0.254 mm)
LOCK RING
STUD
VIEW A ACCEPTABLE CONDITION
L-B7798 (0100)

BM5 79 21 03 4 KDM0 00

Main Oil Filter Housing
Figure 405

end cap of the filter element must be installed before installing the filter element into the cover.

(e)Install the cover (15) as follows.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
INCORRECT INSTALLATION OF THE COVER CAN CAUSE DAMAGE TO THE PACKING.
DO NOT USE THE COVER RETAINING BOLTS TO PULL THE COVER INTO THE HOUSING. TO DO SO CAN CAUSE DAMAGE TO THE PACKING.

(f)With the cover (15) in position on the housing (3), carefully push the cover on the housing until the flange of the cover touches the housing.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
BE SURE TO TORQUE THE COVER RETAINING BOLTS TO THE TORQUE SPECIFIED.

(g)Attach the cover (15) with four washers (14) and bolts (13). TORQUE bolts to between 125 and 140 lbf.in. (1.42 and 1.58 m.daN).

(h)Install new packing (9), lubricated with Engine Oil (Material No.P03-001), onto insert (10).

(i)Install insert, lubricated with Engine Oil (Material No.P03-001) into opening in bottom of cover (15). TORQUE insert to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).

(j)Install new packing (11), lubricated with Engine Oil (Material No.P03-001) onto plug (12).

(k)Install plug (12), lubricated with Engine Oil (Material No.P03-001), into previously installed insert (10), TORQUE plug to between 110 and 120 lbf.in. (1.25 and 1.35 m.daN). Install the Lockwire (Material No. P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the plug.

END Pre SB PW4ENG 72-524

Post SB PW4ENG 79-524 and Pre SB PW4ENG 79-79

(3)Install the main oil filter details in the main oil filter housing assembly (3) as follows (Ref. Fig. 403).

(a)Align bolt hole and position keywasher (7) in center of cover (15) with tab of keywasher in mating hole in cover. Secure keywasher with screw (6), lubricated with Engine Oil (Material No.P03-001). TORQUE the screw to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(b)Install spring (5) on keywasher (7). Bend tabs of washer out between coils of spring.

(c)Install new packing (8), lubricated with Engine Oil (Material No.P03-001), into groove in OD of main oil strainer cover (15).

(d)Install filter element (4) into opening in bottom of cover (15). Align the bolt holes and install cover with filter element into main oil filter housing (3).

NOTE : For this build configuration, the removable plug in the outboard end cap of the filter element must be installed before installing the filter element into the cover.

(e)Install the cover (15) as follows.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
INCORRECT INSTALLATION OF THE COVER CAN CAUSE DAMAGE TO THE

PACKING.
DO NOT USE THE COVER RETAINING NUTS TO PULL THE COVER INTO THE HOUSING. TO DO SO CAN CAUSE DAMAGE TO THE PACKING.

(f)With the cover (15) in position over the studs in the housing (3), carefully push the cover on the housing until the flange of the cover touches the housing.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
DO NOT INSTALL THE REMOVED LOCK NUTS; USE NEW NUTS. THE LOCK PROPERTY OF THE NUT DECREASES WITH USE. IF THE NUT BACKS OUT BECAUSE OF THE DECREASE IN LOCK PROPERTY, OIL LOSS AND AN IN-FLIGHT-SHUTDOWN CAN RESULT.
BE SURE TO TORQUE THE COVER RETAINING NUTS TO THE TORQUE SPECIFIED.

(g)Attach the cover (15) to the housing.

1 If self-locking nuts are used, attach the cover to the housing with four washers (14) and nuts (29). Lubricate the threads with Engine Oil (Material No.P03-001). TORQUE nuts to between 150 and 170 lbf.in. (1.7 and 1.92 m.daN).

2 If hex nuts with lockwire provisions are used, attach the cover to the housing with four washers (14) and nuts (30). Lubricate the threads with Engine Oil (Material No.P03-001).
TORQUE nuts to between 125 and 150 lbf.in. (1.42 and 1.69 m.daN).
Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the nuts.

(h)Install new packing (9), lubricated with Engine Oil (Material No.P03-001), onto insert (10).

(i)Install insert, lubricated with Engine Oil (Material No.P03-001) into opening in bottom of cover (15). TORQUE insert to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).

(j)Install new packing (11), lubricated with Engine Oil (Material No.P03-001) onto plug (12).

(k)Install plug (12), lubricated with Engine Oil (Material No.P03-001), into previously installed insert (10), TORQUE plug to between 110 and 120 lbf.in. (1.25 and 1.35 m.daN). Install the Lockwire (Material No. P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the plug.

END SB PW4ENG 72-524 and END Pre SB PW4ENG 79-79
Post SB PW4ENG 72-524 and Post PW4ENG 79-79

(4)Install the main oil filter details in the main oil filter housing assembly (3) as follows (Ref. Fig. 404).

(a)Install the spring (5) in the spring retainer (23).

(b)Install two screws (22) through the spring retainer screw holes and then install two washers (20) on the ends of the two screws.

(c)Lubricate the threads of the two screws (22) with Engine Oil (Material No.P03-001).

(d)With the spring (5) in place in the spring retainer (23), thread the two screws (22) into the main oil strainer cover (21). TORQUE the two screws to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(e)Install new packing (8), lubricated with Engine Oil (Material

No.P03-001), into groove in OD of main oil strainer cover (21).

(f)Install the filter element (4) into opening in bottom of cover (21). Align the bolt holes and install cover with filter element into main oil filter housing (3).

NOTE : For this build configuration, the removable plug in the outboard end cap of the filter element must be removed before installing the filter element into the cover.

(g)Install the cover (21) as follows.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
INCORRECT INSTALLATION OF THE COVER CAN CAUSE DAMAGE TO THE PACKING.
DO NOT USE THE COVER RETAINING NUTS TO PULL THE COVER INTO THE HOUSING. TO DO SO CAN CAUSE DAMAGE TO THE PACKING.

(h)With the cover (21) in position over the studs in the housing (3), carefully push the cover on the housing until the flange of the cover touches the housing.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
DO NOT INSTALL THE REMOVED LOCK NUTS; USE NEW NUTS. THE LOCK PROPERTY OF THE NUT DECREASES WITH USE. IF THE NUT BACKS OUT BECAUSE OF THE DECREASE IN LOCK PROPERTY, OIL LOSS AND AN IN-FLIGHT-SHUTDOWN CAN RESULT.
BE SURE TO TORQUE THE COVER RETAINING NUTS TO THE TORQUE SPECIFIED.

(i)Attach the cover (21) to the housing.

1 If self-locking nuts are used, attach the cover to the housing with four (4) washers (14) and nuts (29). Lubricate the threads with Engine Oil (Material No.P03-001). TORQUE nuts to between 150 and 170 lbf.in. (1.70 and 1.92 m.daN).

2 If hex nuts with lockwire provisions are used, attach the cover to the housing with four washers (14) and nuts (30). Lubricate the threads with Engine Oil (Material No.P03-001). TORQUE nuts to between 125 and 150 lbf.in. (1.42 and 1.69 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the nuts.

(j)Install new packing (9), lubricated with Engine Oil (Material No.P03-001), onto insert (10).

(k)Install insert, lubricated with Engine Oil (Material No.P03-001) into opening in bottom of cover (21). TORQUE insert to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).

(l)Install new packing (11), lubricated with Engine Oil (Material No.P03-001) onto plug (12).

(m)Install plug (12), lubricated with Engine Oil (Material No.P03-001), into previously installed insert (10), TORQUE plug to between 110 and 120 lbf.in. (1.25 and 1.35 m.daN). Install the Lockwire (Material No. P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the plug.

END SB PW4ENG 72-524 and END SB PW4ENG 79-79

R **ON A/C 101-104,

R Post SB 72-2030 For A/C 101-104,

C. Installation (Ref. Fig. 402)

(1)Install the main oil filter details in the main oil filter housing assembly (3) as follows (Ref. Fig. 402).

(a)Install new packing (8), lubricated with Engine Oil (Material No.P03-001), into groove in OD of main oil strainer cover (42).

(b)Remove the protective closure from the end of the filter element (39).

(c)Install the filter element (39) over the pressure relief valve (41) in cover (42). Align the bolt holes and dowel pin in the cover with studs and dowel pin hole in main oil filter housing (3), then install cover with filter element into main oil filter housing.

NOTE : For this build configuration, the removable plug in the outboard end cap of the filter element must be removed before installing the filter element into the cover.

(d)Install the cover (42) as follows.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
INCORRECT INSTALLATION OF THE COVER CAN CAUSE DAMAGE TO THE PACKING.
DO NOT USE THE COVER RETAINING NUTS TO PULL THE COVER INTO THE HOUSING. TO DO SO CAN CAUSE DAMAGE TO THE PACKING.

(e)With the cover (42) in position over the studs and dowel pin hole in the housing, carefully push the cover on the housing until the flange of the cover touches the housing.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
DO NOT INSTALL THE REMOVED LOCK NUTS; USE NEW NUTS. THE LOCK PROPERTY OF THE NUT DECREASES WITH USE. IF THE NUT BACKS OUT BECAUSE OF THE DECREASE IN LOCK PROPERTY, OIL LOSS AND AN IN-FLIGHT-SHUTDOWN CAN RESULT.
BE SURE TO TORQUE THE COVER RETAINING NUTS TO THE TORQUE SPECIFIED.

(f)Attach the cover (42) with four washers (14) and nuts (29). TORQUE nuts to between 150 and 170 lbf.in. (1.7 and 1.92 m.daN).

(2)Install new packing (11), lubricated with Engine Oil (Material No.P03-001), onto plug (12).

(3)Install plug (12), lubricated with Engine Oil (Material No.P03-001), into threaded hole in bottom of cover (42). TORQUE plug to between 110 and 120 lbf.in. (1.25 and 1.35 m.daN).
Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the plug.

**ON A/C 101-200,

D. Close-Up and Test
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Service the engine oil system (Ref. 12-13-79, P. Block 1).
(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(4)Remove safety clips and tags and close circuit breakers.
(5)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

OIL PRESSURE REGULATOR VALVE- REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P03-001	Oils (Ref. 70-00-00)
R C. Material No.P06-054	Lubricants (Ref. 70-00-00)
D.	Container, Capacity 5 U.S. Gallons (19 L)
E.	Packings
F.	Torque Wrench
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401, 402)

WARNING : BE VERY CAREFUL WHEN YOU REMOVE THE RELIEF VALVE PLUG. THE PLUG HAS SPRING PRESSURE ON IT AND INJURY CAN OCCUR.

(1)Remove the lockwire from the relief valve plug (1) (Ref. Fig. 401).

(2)Remove the plug (1) from the pressure relief valve housing (6).

(3)Discard the packing (2) from the plug (1).

(4)Remove the spring (3) and the pressure relief valve (4) from the relief valve housing (6).

NOTE : Catch the oil in a container with a minimum capacity of 5 U.S. gallons (19 liters).

(5)Discard the packing (5) from the valve (4).

(6)Remove the relief valve housing (6) from the main oil filter housing as follows only if :

- you see damage inside the housing (6) or
- you see leakage from the mating flange of the housing (6) or
- you must replace the internal packings (7) and (8).

(a)Loosen the couplings at both ends of oil filter differential pressure switch inlet and outlet tube assemblies (1) and (2) (Ref. Fig. 402).

(b)Loosen and remove nut (5), screw (3), washer (4), and clamp (6) attaching outlet pressure tube assembly (2) to lower end of relief valve bracket (10).

(c)Loosen and remove nut (10), screw (8), washer (9), and two clamps (11) holding inlet and outlet pressure tube assemblies to tube assembly clamp bracket (7).

(d)Remove the tube assemblies (1) and (2).

(e)Remove the clamp bolt (12) and nut (13) that attach the clamp (14) and wire harness to the bracket (10) (Ref. Fig. 401).

(f)Remove the three bolts (9) and (15) and the clamp bracket (7) and relief valve bracket (10) that attach the housing (6) to the main oil

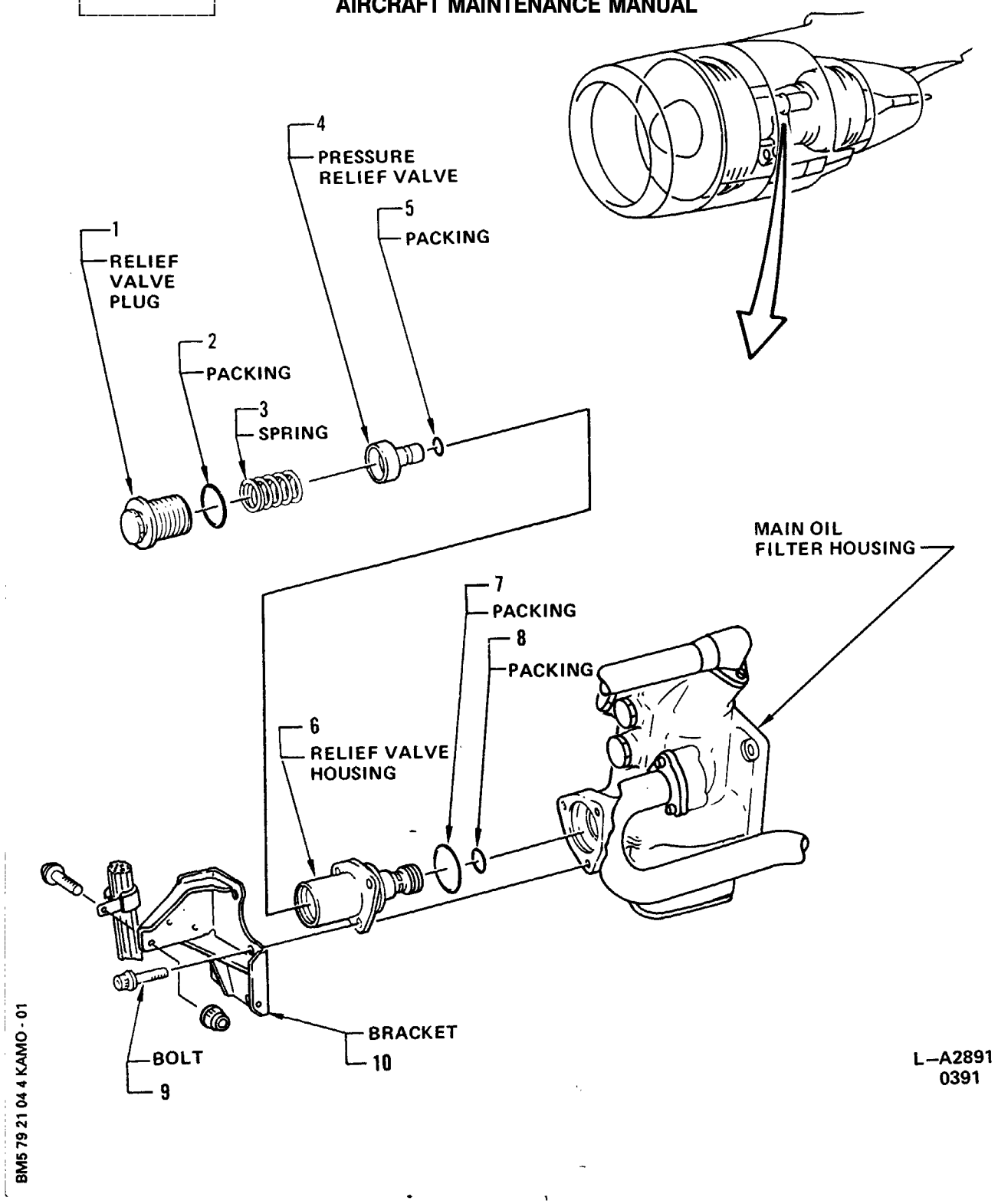
filter housing.
(g)Remove the housing (6) from the main oil filter housing.
(h)Discard the packings (7) and (8) from the housing (6).
(i)Install the protection covers.

C. Installation (Ref. Fig. 401, 402)
(1)If necessary, install the relief valve housing (6) as follows.
(a)Remove the protection covers.
(b)Install the two new packings (7) and (8), lubricated with Material No.P03-001, to the housing (6).
(c)Install the housing (6) to the opening in the front of the main oil filter housing.
R (d)Install bolt (9), lubricated with Material No.P06-054, and attach the relief valve bracket (10) to the relief valve housing (6).
(e)TORQUE bolt (9) to between 125 and 140 lbf.in. (1.41 and 1.58 m.daN).
(f)Attach clamp bracket (7) on relief valve bracket (10) and relief valve housing (6) using two bolts (15) (Ref. Fig. 402).
(g)Install the clamp bolt (12), lubricated with Material No.P03-001, and nut (13) and attach the wire harness to the relief valve bracket (10) with clamp (14).
(h)TORQUE the nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(i)Position tube assemblies (1) and (2) relative to connection points.
(j)Install nut (10), screw (8), washer (9), and two clamps (11) to tube assemblies and then to clamp bracket (7).
(k)TORQUE the nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(l)Secure the outlet tube assembly clamp (6) to the relief valve bracket (10) with nut (5), washer (4), and screw (3).
(m)TORQUE the nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(n)Install the tube assembly couplings on oil filter differential pressure switch and TORQUE tube couplings to between 135 and 150 lbf.in. (1.52 and 1.69 m.daN).
(2)Install the new packing (5), lubricated with Material No.P03-001, to the pressure relief valve (4).
(3)Install the pressure relief valve (4) into the housing (6) with the packing end first.
(4)Install the new packing (2), lubricated with Material No.P03-001, to the relief valve plug (1).
(5)Install the spring (3) to the plug (1).
(6)Install both the spring (3) and the plug (1), threads lubricated with Material No.P03-001, to the housing (6).
(7)TORQUE the plug (1) to between 650 and 750 lbf.in. (7.34 and 8.47 m.daN).
(8)Install the lockwire.

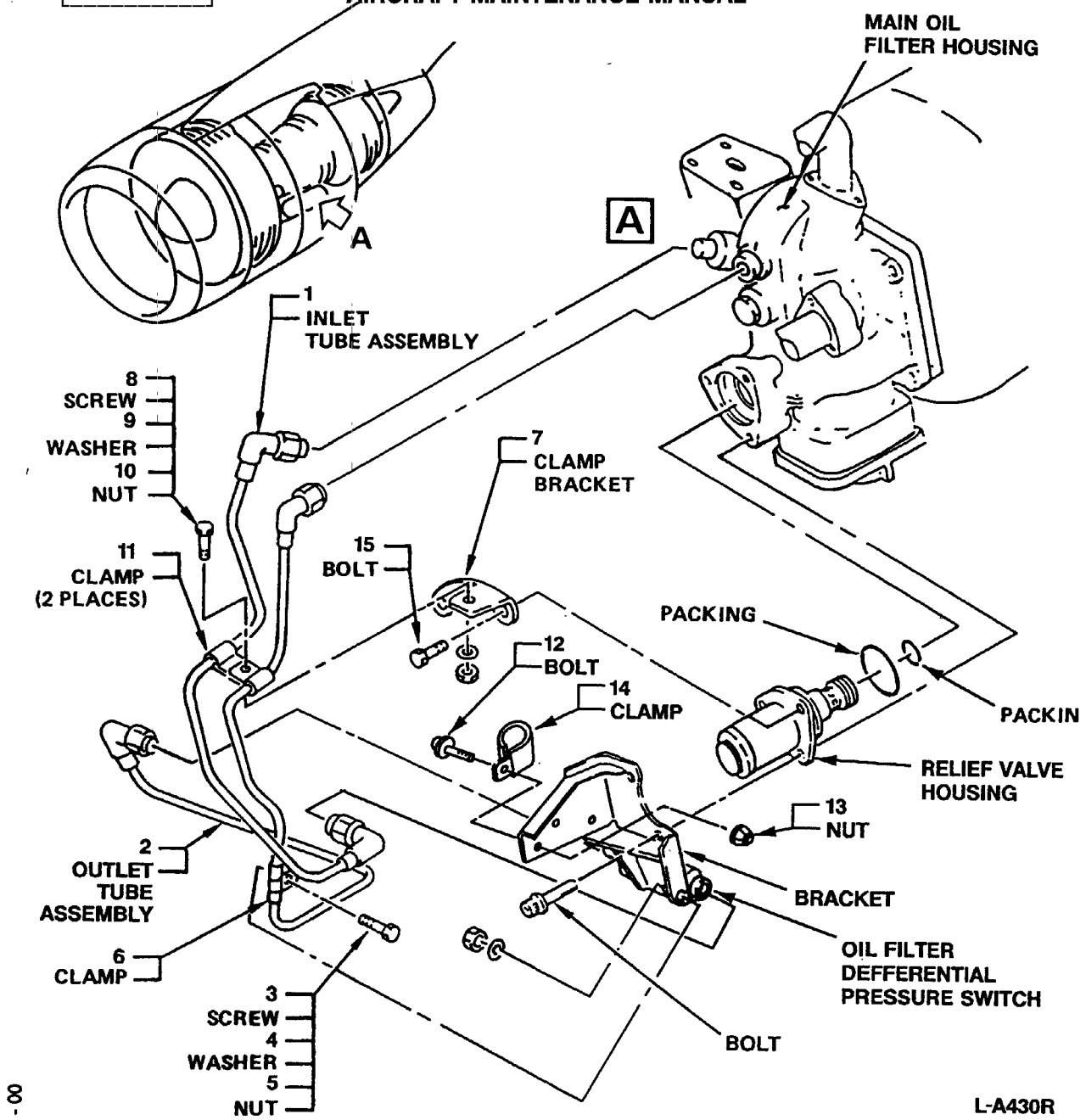
D. Test
(1)Perform oil pressure test (Ref. 71-00-00, P. Block 501).

E. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

Remove safety clips and tags and close circuit breakers.



Oil Pressure Regulator Valve
Figure 401



Oil System (Regulating) Pressure Relief Valve
Figure 402

FUEL/OIL COOLER - REMOVAL/INSTALLATION

1. Equipment and Materials

	ITEM	DESIGNATION
	A.	Circuit Breaker Safety Clips
	B. Material No.P03-001	Oils (Ref. 70-00-00)
	C. Material No.P05-289	Special Materials (Ref. 70-00-00)
	D. Material No.P05-291	Special Materials (Ref. 70-00-00)
	E. Material No.P05-292	Special Materials (Ref. 70-00-00)
	F. Material No.P06-054	Lubricants (Ref. 70-00-00)
	G. Material No.P06-021	Lubricants (Ref. 70-00-00)
	H. Material No.P06-036	Lubricants (Ref. 70-00-00)
R	J.	Cotter Pin
R	K.	Ferrule
R	L.	Gasket
R	M.	Keywasher
R	N.	Packings
R	P.	Retainers
R	Q.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
R	R.	Container Min. Capacity of 5 U.S. Gal. (19 l)
	Referenced Procedures	
	- 70-00-00, P. Block 201	Engine Standard Practices
	- 71-00-00, P. Block 501	Power Plant - General
	- 71-13-00, P. Block 301	Cowl Doors
	- 73-12-02, P. Block 401	Fuel Bypass Valve
	- 79-21-07, P. Block 401	Oil Cooler Bypass Valve
	- 24-11-27, P. Block 401	IDG Oil Cooler Tube Assembly
	- 79-21-04, P. Block 401	Oil Pressure (Regulator) Valve
	- 79-21-41, P. Block 401	Housing Assembly - Main Bearing Strainer
	- 79-31-11, P. Block 401	Oil Quantity Transmitter

2. Procedure

NOTE : This procedure is available on aircraft equipped with PHASE I configured engines.

A. Job Set-Up

(1)On the FIRE control module (overhead panel) of the engine concerned pull the fire handle and install a warning notice to prohibit actuation in normal position (pushed) while maintenance is in progress.

(2)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES-ENG1 FADEC SOLENOIDS CH.A	19KS	332/U70
133VU	ENGINES-ENG1 FADEC SOLENOIDS CH.B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES-ENG2 FADEC SOLENOIDS CH.A	18KS	332/U71
133VU	ENGINES-ENG2 FADEC SOLENOIDS CH.B	20KS	331/V69

(3)Open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(4)Remove fuel bypass valve (Ref. 73-12-02, P. Block 401).
(5)Remove IDG oil cooler oil out tube assembly (Ref. 24-11-27, P. Block 401).
(6)Remove oil pressure switch tube assemblies (Ref. 79-21-04, P. Block 401).
(7)Remove oil quantity transmitter cooling tube assembly (Ref. 79-31-11, P. Block 401).

B. Removal for Engine Not Equipped with Front Split Mount Bracket (Pre SB PW4 ENG 79-20)
(1)Disconnect harnesses from fuel/oil cooler. (Ref. Fig. 401)
(a)Disconnect W3P5 and W5P5 harness connectors from oil cooler bypass valve solenoid.
(b)Remove bolts and nuts securing W3 and W5 harness to brackets at front of cooler and bracket below cooler.
(c)Install protective closures to connectors.
(d)Remove four bolts securing loop clamp brackets to fuel/oil cooler. Remove brackets and reinstall bolts handtight.
(2)Disconnect tubes from fuel/oil cooler and fuel/oil cooler bypass valve (Ref. Fig. 402)
R NOTE : Be prepared to catch fuel and oil in a container with a minimum
R capacity of 5 U.S. gallons (19 liters).
(a)Loosen and remove all clamps bolts and nuts securing the following tubes to HPC case brackets and to each other.
1 Oil cooler inlet fuel tubes (two) (FM10, FM12)
2 Oil cooler inlet oil tube (airframe)
3 Air cooler outlet oil hose and tube assembly
NOTE : Be prepared to catch fuel and oil in a container with a minimum capacity of 5 U.S. gallons (19 liters).
(b)Remove lockwire or safety cable and disconnect oil cooler inlet return manifold from front of fuel/oil cooler.
(c)Remove six bolts securing two oil cooler inlet fuel tubes (FM10, FM12) to fuel pump and fuel bypass value. Remove lockwire or safety cable and disconnect same tubes from fuel/oil cooler. Disengage tubes at both ends. Remove and discard packing and retainers.
(d)Remove lockwire or safety cable and disconnect left oil cooler inlet oil tube (airframe) from right tube at union at approximately 6 o'clock position.
Remove lockwire or safety cable and disconnect tube from oil bypass valve. Disengage tube. Remove packing and retainer and discard.
(e)Remove lockwire or safety cable and disconnect air cooler outlet oil hose and tube assembly from fuel/oil cooler bypass valve.
(f)Remove lockwire or safety cable and disconnect oil cooler bypass valve drain tube from fuel/oil cooler bypass valve.
(g)Remove lockwire or safety cable and disconnect oil cooler outlet fuel tube (FM11) from rear of fuel/oil cooler.
(3)Remove main bearing strainer housing (Ref. 79-21-41, P. Block 401).

(4)Remove fuel/oil cooler. (Ref. Fig. 403)
(a)Remove four bolts and three washers securing rear of oil cooler to HPC

case bracket. Remove loop clamp bracket.

WARNING : TAKE NECESSARY PRECAUTIONS TO AVOID EXCESSIVE CONTACT WITH FUEL AND OIL DRAINAGE DURING REMOVAL OF COOLER.

(b)Raise rear of cooler off tube connections and move rearward to disengage front mount pin. Reposition W3 and W5 harness forward of cooler. Remove cooler from engine forward end first.

(c)Remove front oil cooler bracket from pin on cooler.

(d)Remove all packings and retainers from tubes and discard.

(e)Install protective closures.

(5)If fuel/oil cooler is to be replaced, comply with the following. (Ref. Fig. 404)

(a)Remove tube adapters and plugs from fuel/oil cooler. Discard packings.

(b)Remove cotter pin, nut, and pin, from fuel/oil cooler front ear.

(c)Remove fuel/oil cooler bypass valve and adapters if required. (Ref. 79-21-07, P. Block 401).

(d)Install protective closures.

C. Removal for Engine Equipped With Front Split Mount Bracket (Post SB PW4 ENG 79-20)

(1)Disconnect harnesses from fuel/oil cooler. (Ref. Fig. 401)

(a)Disconnect W3P5 and W5P5 harness connectors from oil cooler bypass valve solenoid.

(b)Remove bolts and nuts securing W3 and W5 harness to brackets at front of cooler and bracket below cooler.

(c)Install protective closures to connectors.

(d)Remove four bolts securing loop clamp brackets to fuel/oil cooler. Remove brackets and reinstall bolts handtight.

(2)Disconnect tubes from fuel/oil cooler and fuel/oil cooler bypass valve. (Ref. Fig. 402)

NOTE : Be prepared catch fuel and oil in a container with a minimum capacity of 5 U.S gallons (19 liters).

(a)Remove lockwire or safety cable and disconnect oil cooler inlet return manifold from front of fuel/oil cooler.

(b)Remove lockwire or safety cable and disconnect two oil cooler inlet fuel tubes (FM10, FM12) from bottom of fuel/oil cooler.

(c)Remove lockwire or safety cable and disconnect oil cooler inlet oil tube (airframe) from fuel/oil cooler bypass valve.

(d)Remove lockwire or safety cable and disconnect air cooler outlet oil hose and tube assembly from fuel/oil cooler bypass valve.

(e)Remove lockwire or safety cable and disconnect oil cooler bypass valve drain tube from fuel/oil cooler bypass valve.

(f)Remove lockwire or safety cable and disconnect oil cooler outlet fuel tube (FM11) from rear of fuel/oil cooler.

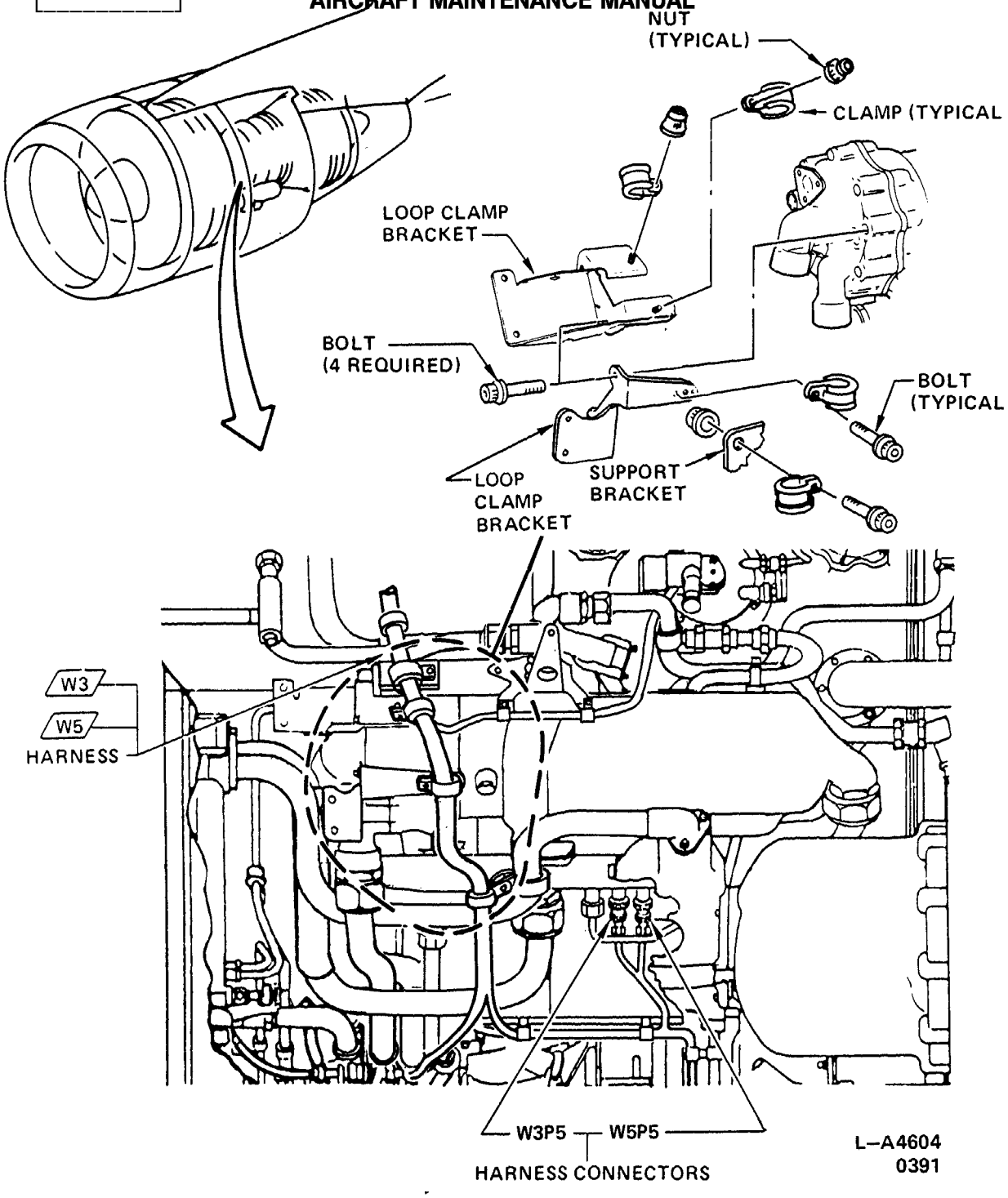
(3)Remove main bearing strainer housing (Ref. 79-21-41, P. Block 401).

(4)Remove fuel/oil cooler. (Ref. Fig. 405)

(a)Remove two bolts securing front oil cooler bracket to HPC case bracket.

(b)Remove four bolts and three washers securing rear of oil cooler to HPC case bracket. Reposition loop clamp bracket rearward.

WARNING : TAKE NECESSARY PRECAUTIONS TO AVOID EXCESSIVE CONTACT WITH FUEL AND OIL DRAINAGE DURING REMOVAL OF COOLER.



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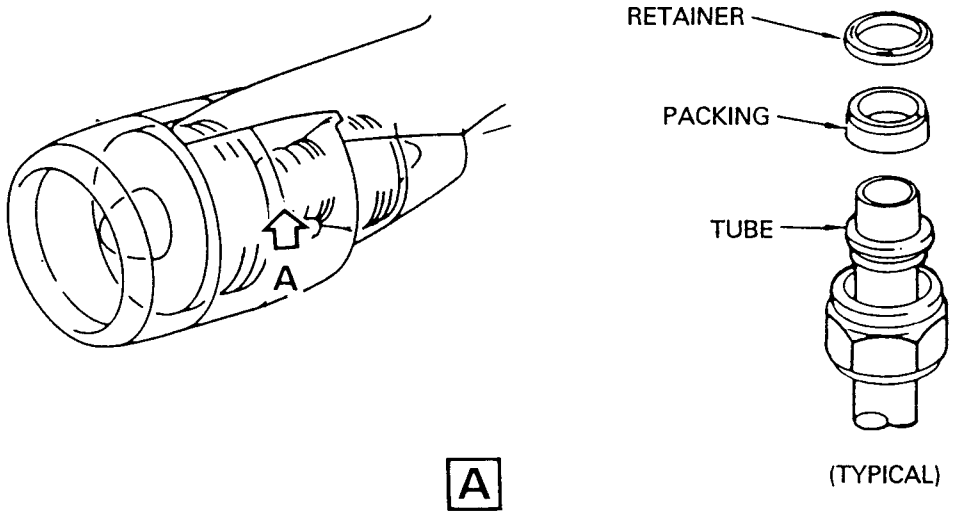
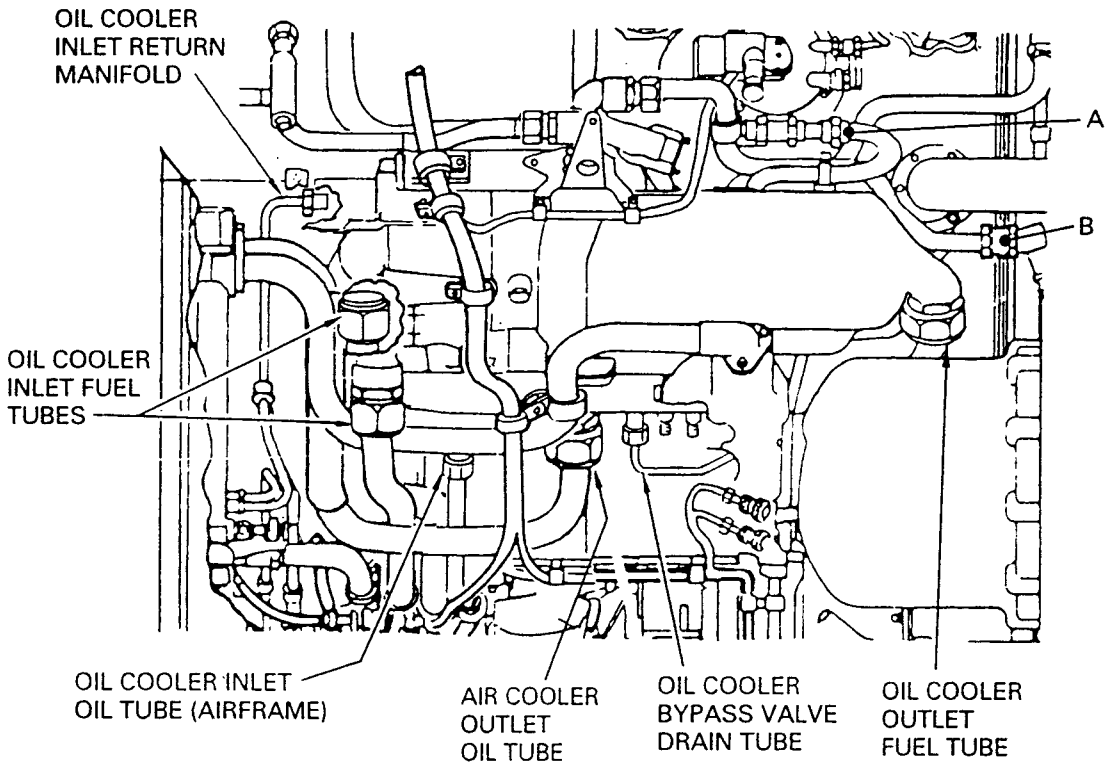
FADEC Wiring Harness and Support Brackets
Figure 401





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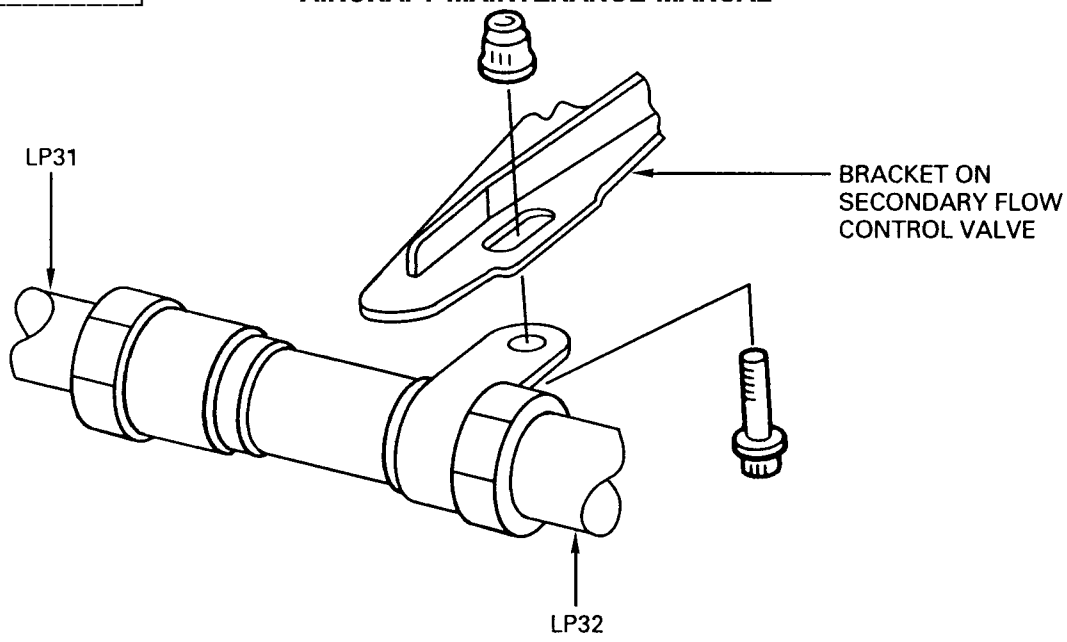
Fuel/Oil Cooler Front and Bottom Tube Connections
(Sheet 1/5)
Figure 402



VIEW A
(POST SB PW4ENG 79 - 52)

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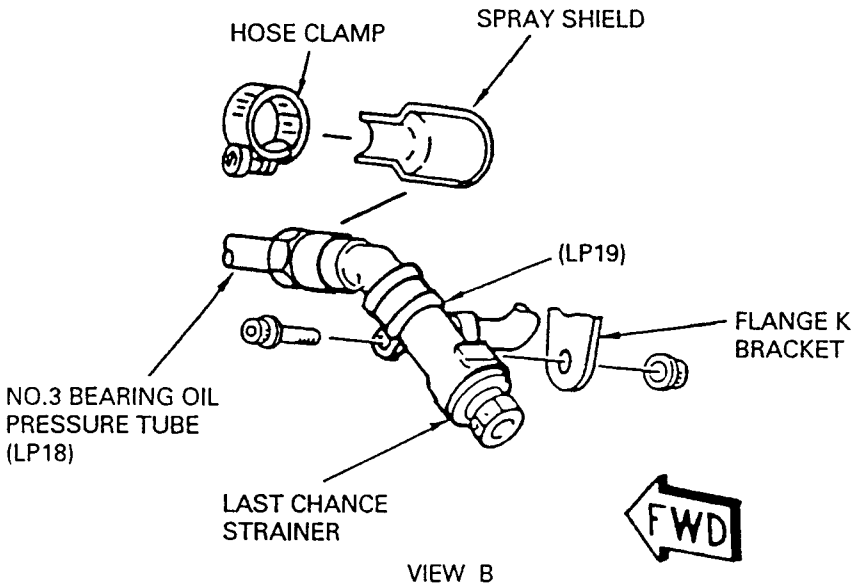
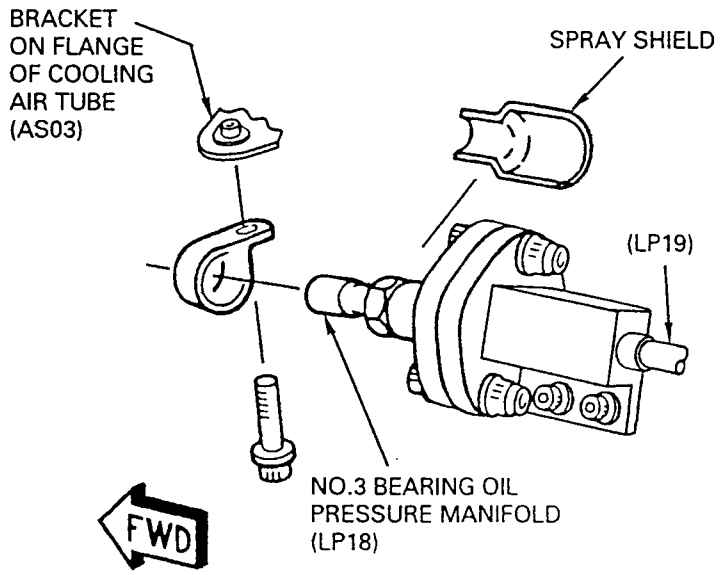
Fuel/Oil Cooler Front and Bottom Tube Connections
(Sheet 2/5)
Figure 402



VIEW B
(PRE SB PW4ENG 79-52)



VIEW B
(POST SB PW4ENG 79-52)

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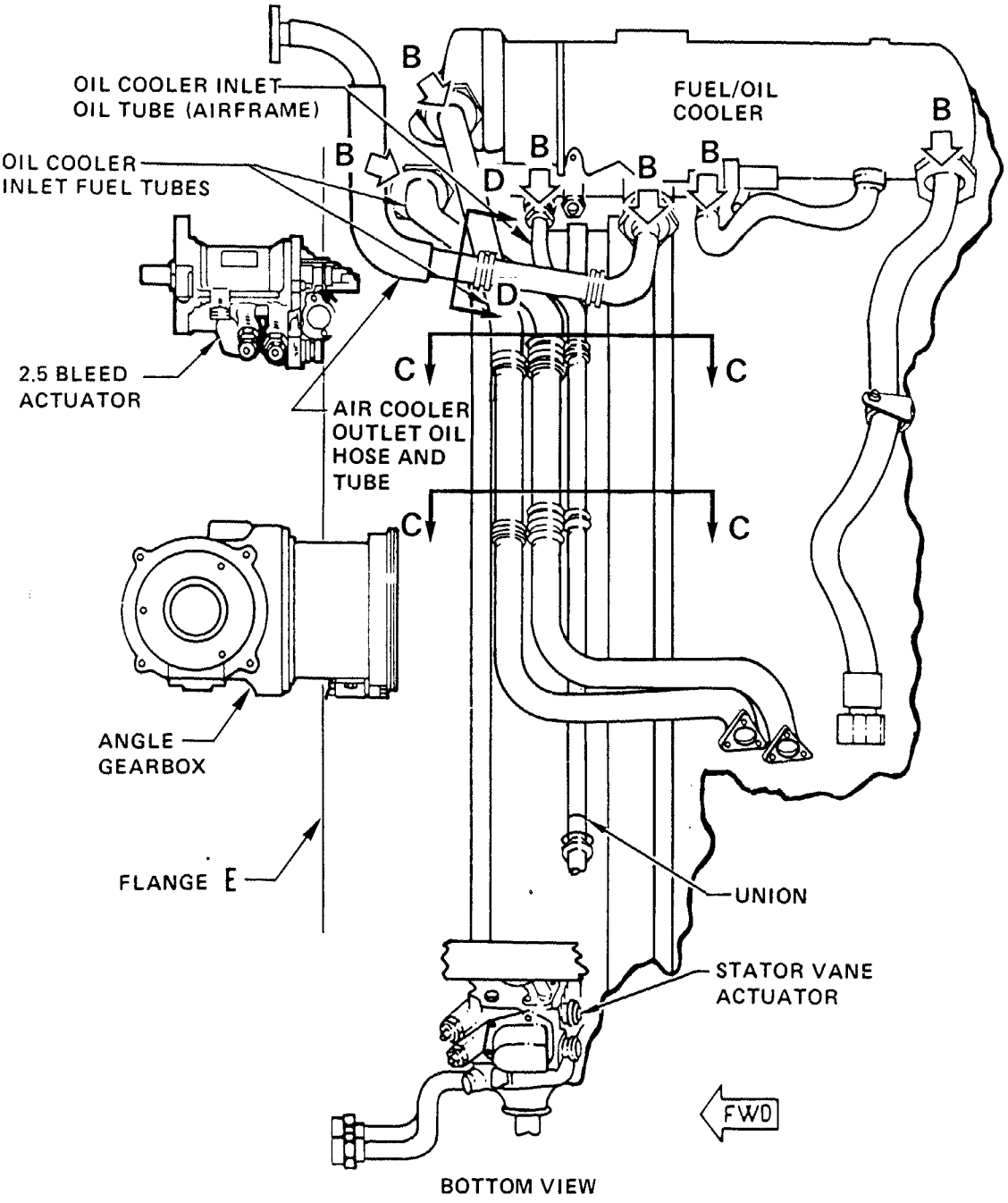
Fuel/Oil Cooler Front and Bottom Tube Connections
(Sheet 3/5)
Figure 402



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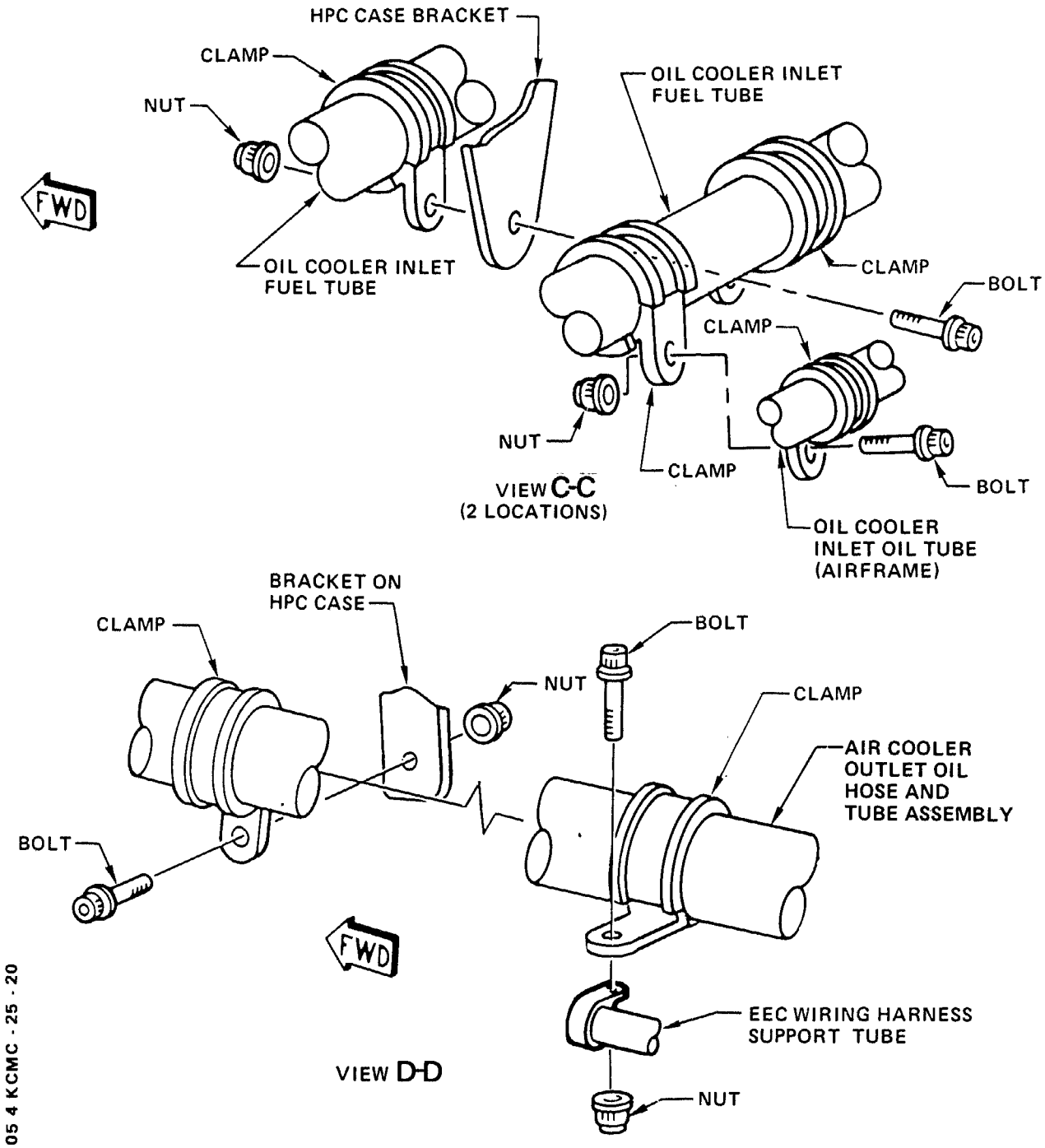
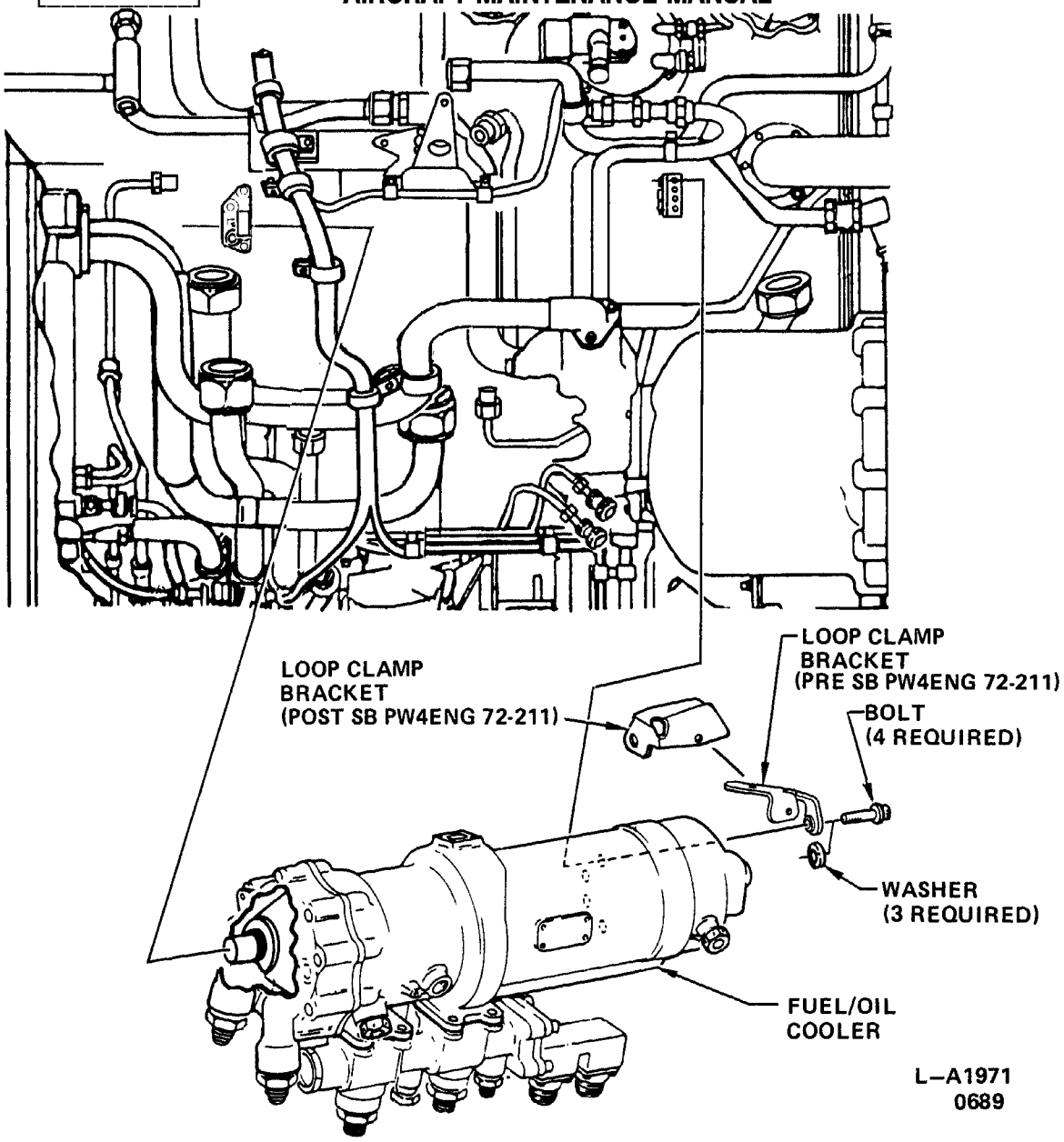
Fuel/Oil Cooler Front and Bottom Tube Connections
(Sheet 4/5)
Figure 402



Fuel/Oil Cooler Front and Bottom Tube Connections
(Sheet 5/5)
Figure 402



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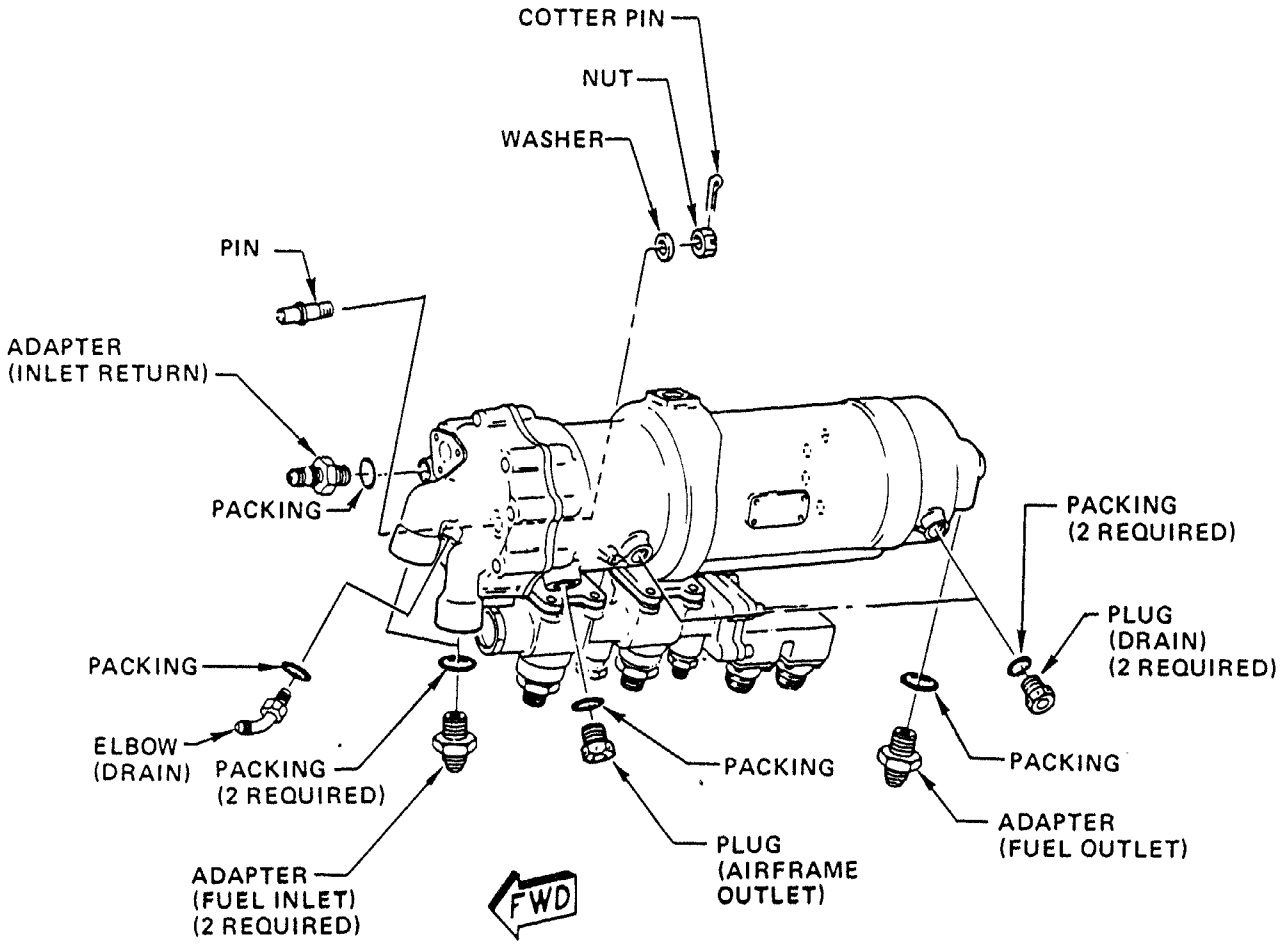
Fuel/Oil Cooler Front and Rear Mounts
Figure 403



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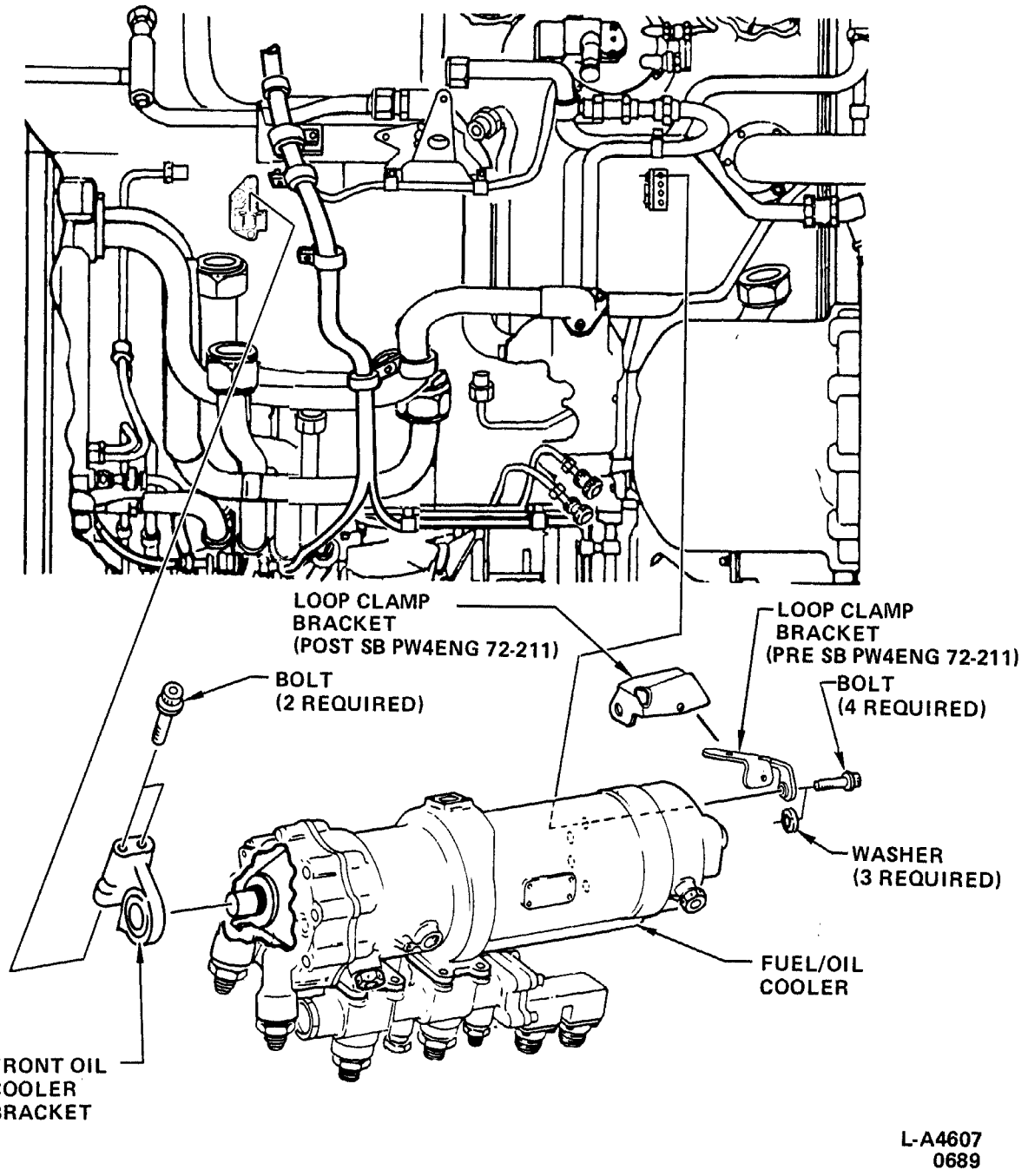
Fuel/Oil Cooler Assembly
Figure 404

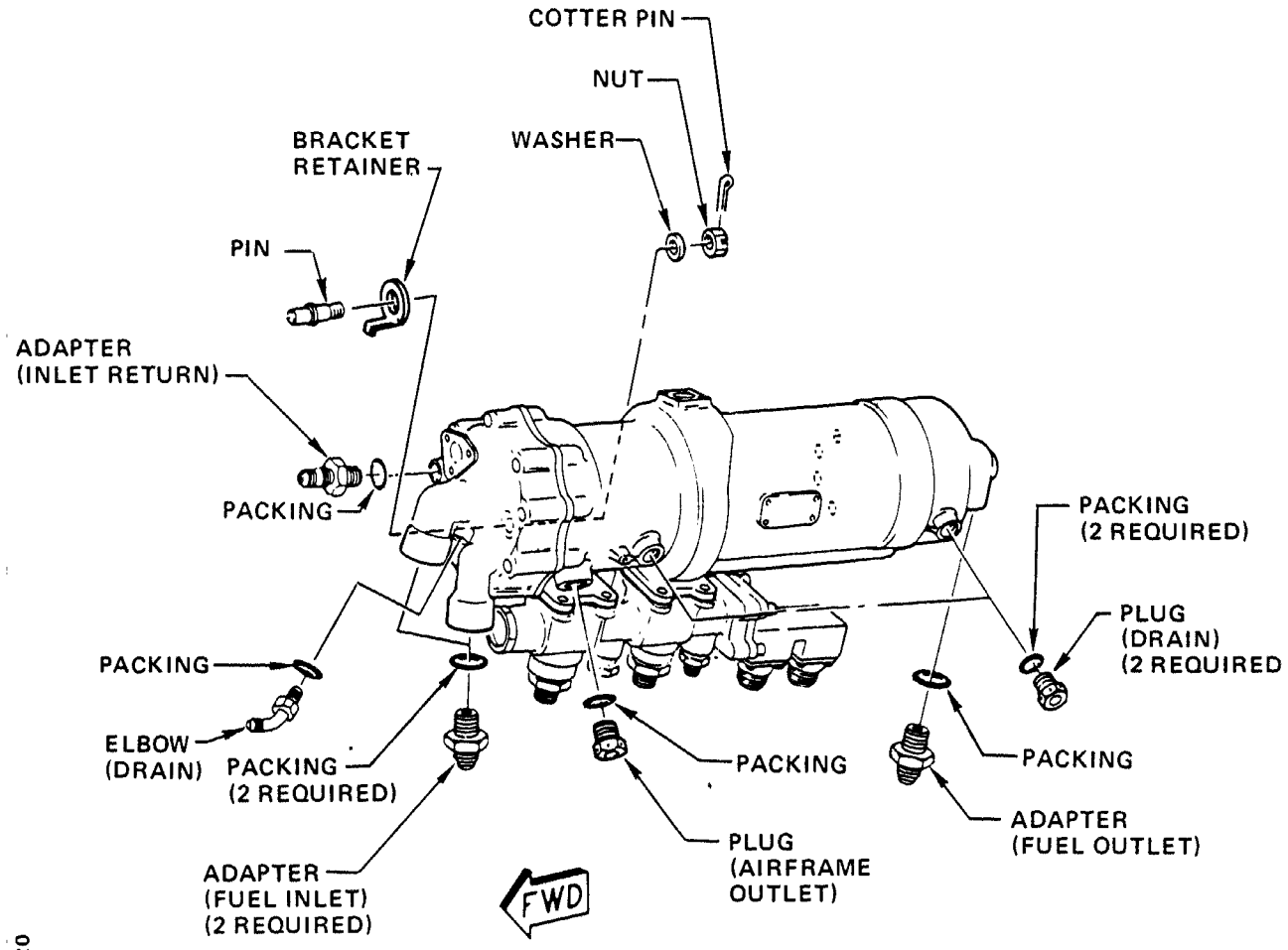
(c)Raise cooler off tube connections and move outward and rearward. Reposition W3 and W5 harness forward of cooler. Remove cooler from engine forward end first.
(d)Remove front oil cooler bracket from pin on cooler.
(e)Remove all packings and retainers from tubes and discard.
(f)Install protective closures.
(5)If fuel/oil cooler is to be replaced, comply with the following. (Ref. Fig. 406)
(a)Remove tube adapters and plugs from fuel/oil cooler. Discard packings.
(b)Remove cotter pin, nut, pin, and oil cooler bracket retainer from fuel/oil cooler front ear.
(c)Remove fuel/oil cooler bypass valve and adapters if required. (Ref. 79-21-07, P. Block 401).
(d)Install protective closures.

D. Installation for Engine Not Equipped with Front Split Mount Bracket
(1)If new replacement fuel/oil cooler is to be installed, comply with the following. (Ref. Fig. 404)
(a)Remove protective closures.
(b)Install fuel/oil cooler bypass valve. (Ref. 79-21-07, P. Block 401)
(c)Install pin, threads lubricated with Engine Oil (Material No.P03-001), to front mounting ear and secure with washer and nut. TORQUE nut to between 550 and 750 lbf.in. (6.214 and 8.474 m.daN) aligning cotter pin hole.
Install cotter pin and secure.
(d)Install adapter (inlet return), threads lubricated with Engine Oil (Material No.P03-001), and packing, lubricated with Engine Oil (Material No.P03-001), to fuel/oil cooler port. TORQUE adapter to between 110 and 120 lbf.in. (1.24 and 1.35 m.daN).
(e)Install elbow and jamnut, threads lubricated with Engine Oil (Material No.P03-001), and packing, lubricated with Engine Oil (Material No.P03-001), to fuel/oil cooler port. (Elbow jamnut to be torqued after alignment of elbow with drain tube).
(f)Install two adapters (fuel inlet) and one adapter (fuel outlet), threads lubricated with Engine Oil (Material No.P03-001), and packings, lubricated with Engine Oil (Material No.P03-001), to fuel/oil cooler ports. TORQUE three adapters to between 650 and 750 lbf.in. (7.34 and 8.47 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the adapters.
(g)Install two plugs (drain), threads lubricated with Engine Oil (Material No.P03-001), and packings, lubricated with Engine Oil (Material No.P03-001), to fuel/oil cooler ports. TORQUE two plugs to between 110 and 120 lbf.in. (1.24 and 1.35 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No. P05-292) to safety the plugs.
(h)Install plug (airframe outlet), threads lubricated with Engine Oil (Material No.P03-001), and packing, lubricated with Engine Oil (Material No.P03-001), to fuel/oil cooler port. TORQUE plug, to between 375 and 425 lbf.in. (4.23 and 4.80 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and



BM5 79 21 05 4 KLMO - 00/30 - 00/25
DM5

Fuel/Oil Cooler Front and Rear Mounts with Front Split Mount
Figure 405



BM5 79 21 05 4 KNMO - 25 - 20
DM5

Fuel/Oil Cooler Assembly with Bracket Retainer
Figure 406

Safety Cable Ferrule (Material No.P05-292) to safety the plug.

(2)Install fuel/oil cooler. (Ref. Fig. 402)

(a)Remove protective closures.

(b)Lubricate adapter (inlet return) threads with Engine Oil (Material No.P03-001). Lubricate remaining adapters on fuel/oil cooler and bypass valve with Antigalling Compound (Material No.P06-021).

(c)Install packing, lubricated with Engine Oil (Material No.P03-001), and retainer to each of the following tubes at fuel/oil cooler end :

1 Oil cooler inlet fuel tube (two) (FM10, FM12).
2 Oil cooler inlet oil tube (airframe).
3 Air cooler outlet oil hose and tube assembly.
4 Oil cooler bypass drain tube.
5 Oil cooler outlet fuel tube (FM11).

(d)Install two packings, lubricated with Engine Oil (Material No.P03-001), to lower flanged ends of oil cooler inlet fuel tubes. Make certain W3 and W5 harness is positioned forward and install cooler (rearward end first) (Ref. Fig. 403).
Move cooler forward (inboard of harness and rear of cooler raised off tubes), to engage front mount pin. Make certain all tubes are aligned and lower rear of cooler onto tubes.

(e)Loop clamp bracket to top bolt hole of rear mount. Secure rear mount with four bolts, threads lubricated with Engine oil (Material No.P03-001), and three washers (omit washer at bracket). TORQUE bolts to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN).

(3)Torque and secure tubes to fuel/oil cooler and fuel/oil cooler bypass valve adapters. (Ref. Fig. 402)

(a)TORQUE oil cooler outlet fuel tube (FM11) to between 150 and
R 160 lbf.in. (1.70 and 1.80 m.daN), then loosen to less than 10 lbf.in.
R (0.11 m.daN) and retorque to same value.

R (b)TORQUE oil cooler bypass drain (LP20) tube to between 65 and 70 lbf.in.
R (0.73 and 0.79 m.daN), then loosen to less than 10 lbf.in. (0.11 m.daN) and retorque to same value.

(c)TORQUE oil cooler inlet return manifold to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).

(d)Connect both ends of oil cooler inlet fuel tubes (two) (FM10, FM12) to fuel/oil cooler and to fuel pump and bypass valve.
Secure bottom tube flanges with six bolts, threads lubricated with Engine Oil (Material No.P03-001), handtight only. Install clamps, bolts, threads lubricated with Engine Oil (Material No.P03-001), and nuts securing tubes to HPC case brackets at two location. TORQUE clamp bolts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN). TORQUE six bolts securing tube flanges to fuel pump and fuel bypass valve to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). TORQUE tube nuts to fuel/oil cooler to between 150 and 160 lbf.in. (1.70 and 1.80
R m.daN), then loosen to less than 10 lbf.in. (0.11 m.daN) and retorque to same value.

(e)Lubricate union at approximately 6 o'clock position with Antiseize Compound (Material No.P06-054) and connect oil cooler inlet oil tube (airframe) to fuel/oil cooler bypass valve and to union handtight only.
Secure tube to previously installed fuel inlet tube at two location

using clamps, bolts, threads lubricated with Engine Oil (Material No.P03-001), and nuts. TORQUE clamps bolts to between 36 and 40 lbf.in. (0.407 and 0.452 m.daN). TORQUE tube to union to between 675 and 750 lbf.in. (7.62 and 8.47 m.daN) and secure with lockwire. TORQUE nut to bypass valve to between 140 and 160 lbf.in. (1.58 and 1.80
R m.daN), then loosen to less than 10 lbf.in. (0.11 m.daN) and retorque to same value.

(f)Connect air cooler outlet oil hose and tube assembly to bypass valve handtight only. Secure tube to HPC case bracket and FADEC wiring harness support tube using clamps, bolts, threads lubricated with Engine Oil (Material No.P03-001), and nuts. TORQUE clamps, bolts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN). TORQUE hose and tube assembly nut to bypass valve to between 200 and 220 lbf.in. (2.26 and 2.48
R m.dan), then loosen to less than 10 lbf.in. (0.11 m.daN) and retorque to same valve.

(g)Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety all tubes torqued to bottom of fuel/oil cooler and fuel/oil cooler bypass valve adapters.

NOTE : Forward/inboard oil cooler inlet fuel tube to be lockwired to forward outboard wire hole in bypass valve gasket.

(4)Install main bearing strainer housing (Ref. 79-21-41, P. Block 401).

(5)Attach and connect harnesses to fuel/oil cooler and fuel/oil cooler bypass valve. (Ref. Fig. 401)

(a)Install two loop clamp brackets.

1 Remove four bolts and washers from front flange of fuel/oil cooler.

2 Secure two loop clamp brackets to front flange with four bolts, threads lubricated with Engine Oil (Material No.P03-001). Omit washers.

3 TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(b)Remove protective closures. Connect W3P5 and W5P5 harness connectors to front and rear connectors respectively on fuel/oil cooler bypass valve solenoid.

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION. (Ref. 70-00-00, P. Block 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(c)Install three bolts and two nuts, threads lubricated with Engine Oil (Material No.P03-001), securing W3 and W5 harnesses to brackets attached to front of cooler and to bracket below cooler. TORQUE bolts and nuts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

E. Installation for Engine Equipped with Front Split Mount Bracket (Post SB PW4ENG 79-20)

If new replacement fuel/oil cooler is to be installed, comply with the following. (Ref. Fig. 406)

(a)Remove protective closures.

(b)Install fuel/oil cooler bypass valve. (Ref. 79-21-07, P. Block 401).
(c)Install bracket retainer and pin, threads lubricated with Engine Oil (Material No.P03-001), to front mounting ear and secure with washer and nut. TORQUE nut to between 550 and 750 lbf.in. (6.21 and 8.47 m.daN) aligning cotter pin hole. Install cotter pin and secure.
(d)Install adapter (inlet return), threads lubricated with Engine Oil (Material No.P03-001), and packing, lubricated with Engine Oil (Material No.P03-001), to fuel/oil cooler port. TORQUE adapter to between 110 and 120 lbf.in. (1.24 and 1.35 m.daN).
(e)Install elbow and jamnuts, threads lubricated with Engine Oil (Material No.P03-001) and packing, lubricated with Engine Oil (Material No.P03-001), to fuel/oil cooler port. (Elbow jamnut to be torqued after alignment of elbow with drain tube).
(f)Install two adapters (fuel inlet) and one adapter (fuel outlet), threads lubricated with Engine Oil (Material No.P03-001), and packing, lubricated with Engine Oil (Material No.P03-001), to fuel/oil cooler ports. TORQUE three adapters to between 650 and 750 lbf.in. (7.34 and 8.47 m.mdaN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the adapters.
(g)Install two plugs (drain), threads lubricated with Engine Oil (Material No.P03-001), and packings, lubricated with Engine Oil (Material No.P03-001), to fuel/oil cooler ports. TORQUE two plugs to between 110 and 120 lbf.in. (1.24 and 1.35 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the plugs.
(h)Install plug (airframe outlet), threads lubricated with Engine Oil (Material No.P03-001), and packing, lubricated with Engine Oil (Material No.P03-001) to fuel/oil cooler port. TORQUE plug, to between 375 and 425 lbf.in. (4.23 and 4.80 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the plug.

(2)Install fuel/oil cooler. (Ref. Fig. 402)
(a)Remove protective closures.
(b)Lubricate adapter (inlet return) threads with Engine Oil (Material No.P03-001). lubricate remaining adapters on fuel/oil cooler and bypass valve with Antigalling Compound (Material No.P06-021).
(c)Install packing, lubricated with Engine Oil (Material No.P03-001), and retainer to each of the following tubes :
1 Oil cooler inlet fuel tube (two) (FM10, FM12).
2 Oil cooler inlet oil tube (airframe).
3 Air cooler outlet oil hose and tube assembly.
4 Oil cooler bypass drain tube.
5 Oil cooler outlet fuel tube (FM11).
(d)Install oil cooler front bracket to pin and engage retainer. (Ref. Fig. 405). Make certain W3 and W5 harness is positioned forward and install cooler (rearward end first). Move cooler forward (inboard of harness) and lower onto tubes and HPC case brackets. Make certain all tubes are aligned and engaged in adapters. Install two bolts, threads lubricated with Antiseize Compound (Material No.P06-054), to front bracket and TORQUE to between 125 and 140 lbf.in. (1.41 and

1.58 m.daN).

(e)Slide loop clamp bracket forward to top bolt hole of rear mount. Secure rear mount with four bolts, threads lubricated with Engine Oil (Material No.P03-001), and three washers (omit washer at bracket). TORQUE bolts to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN).

(3)Torque and secure tubes to fuel/oil cooler and fuel/oil cooler bypass valve adapters (Ref. Fig. 402)

(a)TORQUE oil cooler outlet fuel tube (FM11) and oil cooler inlet fuel tubes to between 150 and 160 lbf.in. (1.70 and 1.80 m.daN), then loosen
R to less than 10 lbf.in. (0.11 m.daN) and retorque to same value.
R (b)TORQUE oil cooler bypass drain (LP20) tube to between 65 and 70 lbf.in.
R (0.73 and 0.79 m.daN), then loosen to less than 10 lbf.in. (0.11 m.daN) and retorque to same value.
R (c)TORQUE air cooler outlet oil tube (LP03) to between 200 and 220 lbf.in.
R 2.26 and 2.48 m.daN), then loosen to less than 10 lbf.in. (0.11 m.daN) and retorque to same value.
R (d)TORQUE oil cooler inlet oil tube (LS05) (airframe) to between 140 and
R 160 lbf.in. (1.58 and 1.80 m.daN), then loosen to less than 10 lbf.in.
R (0.11 m.daN) and retorque to same value.

(e)TORQUE oil cooler inlet return manifold to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).

(f)Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety all tubes torqued to bottom of fuel/oil cooler and fuel /oil cooler bypass valve adapters.

NOTE : Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the forward inboard oil cooler inlet fuel tube to the forward outboard wire hole in bypass valve gasket.

(4)Install main bearing strainer housing (Ref. 79-21-41, P. Block 401).

(5)Attach and connect harnesses to fuel/oil cooler and fuel/oil cooler bypass valve. (Ref. Fig. 401)

(a)Install two loop clamp brackets.

1 Remove four bolts and washers from front flange of fuel/oil cooler.

2 Secure two loop clamp brackets to front flange with four bolts, threads lubricated with Engine Oil (Material No.P03-001). Omit washers.

3 TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(b)Remove protective closures. Connect W5P5 and W3P5 harness connectors to front and rear connectors respectively on fuel/oil cooler bypass valve solenoid.

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION. (Ref. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(c)Install three bolts and two nuts, threads lubricated with Engine Oil

(Material No.P03-001), securing W3 and W5 harnesses to brackets attached to front of cooler and to bracket below cooler. TORQUE bolts and nuts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

F. Close-Up and Test
(1)Install oil quantity transmitter cooling tube assembly (Ref. 79-31-11, P. Block 401).
(2)Install oil pressure switch tube assemblies (Ref. 79-21-04, P. Block 401).
(3)Install IDG oil cooler oil out tube assembly (Ref. 24-11-27, P. Block 401).
(4)Install fuel bypass valve (Ref. 73-12-02, P. Block 401).
(5)On the appropriate FIRE control module, push the fire handle and remove the warning notice.
(6)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.
(7)Remove safety clips and tags and close circuit breakers 18KS, 19KS, 20KS and 21KS.
(8)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

2. Procedure

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

NOTE : This procedure is available on aircraft equipped with PHASE III configured engines.

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

A. Job Set-Up
(1)On the FIRE control module (overhead panel) of the engine concerned, pull the fire handle and install a warning notice to prohibit actuation in normal position (pushed) while maintenance is in progress.
(2)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES-ENG1 FADEC SOLENOIDS CH.A	19KS	332/U70

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES-ENG1 FADEC SOLENOIDS CH.B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES-ENG2 FADEC SOLENOIDS CH.A	18KS	332/U71
133VU	ENGINES-ENG2 FADEC SOLENOIDS CH.B	20KS	331/V69

(3)Open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(4)Remove the IDG oil cooler oil out tube assembly (Ref. 24-11-27, P. Block 401).
(5)Remove the oil pressure switch tube assemblies (Ref. 79-21-04, P. Block 401).
(6)Remove the oil quantity transmitter cooling tube assembly (Ref. 79-31-11, P. Block 401).

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

B. Removal
(Ref. Fig. 407, 408)
(Ref. Fig. 409, 410)
(1)Disconnect the harnesses from the fuel/oil cooler (Ref. Fig. 407)
(a)Disconnect W3P5 and W5P5 harness connectors from the oil cooler bypass valve solenoid.
(b)Remove the bolts and nuts which attach the W3 and W5 harness to the brackets at the front of cooler and the bracket below the cooler.
(c)Install protective closures to the connectors.
(d)Remove the four bolts which attach the loop clamp brackets to the fuel/oil cooler. Remove the brackets and install the bolts handtight.
(2)Disconnect the tubes from the fuel/oil cooler and the fuel/oil cooler bypass valve (Ref. Fig. 408)
NOTE : Be prepared to catch fuel and oil in a container with a minimum capacity of 5 U.S. gallons (19 liters).
(a)Remove the lockwire or safety cable and disconnect the oil cooler inlet return manifold from the front of the fuel/oil cooler.
(b)Remove the lockwire or safety cable and disconnect the two oil cooler inlet fuel tubes (FM10, FM12) from the bottom of the fuel/oil cooler.
(c)Remove the lockwire or safety cable and disconnect the oil cooler inlet oil tube (airframe) from the fuel/oil cooler bypass valve.
(d)Remove the lockwire or safety cable and disconnect the air cooler outlet oil hose and tube assembly from the fuel/oil cooler bypass valve.
(e)Remove the lockwire or safety cable and disconnect the oil cooler bypass valve drain tube from the fuel/oil cooler bypass valve.
(f)Remove the lockwire or safety cable and disconnect the oil cooler outlet fuel tube (FM11) from the rear of the fuel/oil cooler.

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

(3)Remove the main bearing strainer housing (Ref. 79-21-41, P.Block 401).

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

(4)Remove the fuel/oil cooler (Ref. Fig. 409)
(a)Remove the two bolts that attach the front oil cooler bracket to the HPC case bracket.
(b)Remove the four bolts and three washers which attach the rear of the oil cooler to the HPC case bracket. Move the loop clamp bracket rearward.
WARNING : TAKE THE NECESSARY PRECAUTIONS TO AVOID CONTACT WITH FUEL AND OIL DRAINAGE DURING REMOVAL OF THE COOLER.
(c)Lift the cooler off the tube connections and move it outward and rearward. Move the W3 and W5 harness forward of the cooler. Remove the cooler from the engine forward end first.
(d)Remove the front oil cooler bracket from the pin on the cooler.
(e)Remove and discard all the packings and retainers from the tubes.
(f)Install protective closures.
(5)If the fuel/oil cooler must be replaced, do the following (Ref. Fig. 410)
(a)Remove the tube adapters and plugs from the fuel/oil cooler. Discard the packings.
(b)Remove the cotter pin, nut, pin and oil cooler bracket retainer from the fuel/oil cooler front ear.
(c)Remove the fuel/oil cooler bypass valve and adapters if necessary (Ref. 79-21-07, P. Block 401).
(d)Install protective closures.

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

C. Installation
(1)If a new replacement fuel/oil cooler must be installed, do the following (Ref. Fig. 410)
(a)Remove the protective closures.
(b)Install the fuel/oil cooler bypass valve (Ref. 79-21-07, P. Block 401)
(c)Install the bracket retainer and pin, threads lubricated with Engine Oil (Material No.P03-001), to the front mounting ear and attach with

the washer and nut. TORQUE the nut to between 550 and 750 lbf.in. (6.21 and 8.47 m.daN) while you align the cotter pin hole. Install and bend the cotter pin.

(d)Install the adapter (inlet return), threads lubricated with Engine Oil (Material No.P03-001) and packing, lubricated with Engine Oil Material No.P03-001), to fuel/oil cooler port. TORQUE adapter to between 110 and 120 lbf.in. (1.24 and 1.35 m.daN).

(e)Install elbow and jamnut, threads lubricated with Engine Oil (Material No.P03-001) and packing, lubricated with Engine Oil (Material No.P03-001), to fuel/oil cooler port. (Elbow jamnut to be torqued after alignment of elbow with drain tube).

(f)Install two adapters (fuel inlet) and one adapter (fuel outlet), threads lubricated with Engine Oil (Material No.P03-001) and packings, lubricated with Engine Oil (Material No.P03-001), to fuel/oil cooler port. TORQUE three adapters to between 650 and 750 lbf.in. (7.34 and 8.43 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-289) and Safety Cable Ferrule (Material No.P05-292) to safety the adapters.

(g)Install two plugs (drain), threads lubricated with Engine Oil (Material No.P03-001) and packings, lubricated with Engine Oil (Material No.P03-001),to fuel/oil cooler ports. TORQUE two plugs to between 110 and 120 lbf.in. (1.24 and 1.35 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the plugs.

(h)Install plug (airframe outlet), threads lubricated with Engine Oil (Material No.P03-001) and packing, lubricated with Engine Oil (Material No.P03-001), to fuel/oil cooler port. TORQUE plug, to between 375 and 425 lbf.in. (4.23 and 4.80 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the plug.

(2)Install the fuel/oil cooler (Ref. Fig. 408)

(a)Remove the protective closures.

(b)Lubricate the adapter (inlet return) threads with Engine Oil (Material No.P03-001).
Lubricate the remaining adapters on the fuel/oil cooler and bypass valve with Antigalling Compound (Material No.P06-021).

(c)Install the packing, lubricated with Engine Oil (Material No.P03-001) and the retainer to each of the following tubes :
1 Oil cooler inlet fuel tube (two) (FM10, FM12).
2 Oil cooler inlet oil tube (airframe).
3 Air cooler outlet oil hose and tube assembly.
4 Oil cooler bypass drain tube.
5 Oil cooler outlet fuel tube (FM11).

(d)Install the oil cooler front bracket to pin and engage the retainer (Ref. Fig. 409). Make sure the W3 and W5 harness is moved forward and install the cooler (rearward end first).
Move the cooler forward (inboard of the harness) and lower it onto the tubes and the HPC case brackets. Make sure all the tubes are aligned and engaged in the adapters. Install the two bolts, threads lubricated with Antiseize Compound (Material No.P06-054), to the front bracket and TORQUE to between 125 and 140 lbf.in. (1.41 and 1.58 m.daN).

(e)Slide the loop clamp bracket forward to the top bolt hole of the rear mount. Attach the rear mount with four bolts, threads lubricated with Engine Oil (Material No.P03-001) and three washers (no washer at the bracket). TORQUE the bolts to between 180 and 200 lbf.in. (2.03 and 2.25 m.daN).

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

(3)Attach and torque the tubes to the fuel/oil cooler and the fuel/oil cooler bypass valve adapters (Ref. Fig. 408)
(a)TORQUE the oil cooler outlet fuel tube (FM11) and the oil cooler inlet fuel tubes (FM10, FM12) to between 150 and 160 lbf.in. (1.70 and
R 1.80 m.daN), then loosen to less than 10 lbf.in. (0.11 m.daN) and torque to the same value again.
R (b)TORQUE the oil cooler bypass drain (LP20) tube to between 65 and
R 70 lbf.in. (7.34 and 7.90 m.daN), then loosen to less than 10 lbf.in.
R (0.11 m.daN) and torque to the same value again.
R (c)TORQUE the air cooler outlet oil tube (LP03) to between 200 and
R 220 lbf.in. (2.25 and 2.48 m.daN) then loosen to less than 10 lbf.in.
R (0.11 m.daN) and torque to the same value again.
R (d)TORQUE the oil cooler inlet oil tube (LS05) (airframe) to between 140
R and 160 lbf.in. (1.58 and 1.80 m.daN) then loosen to less than
R 10 lbf.in. (0.11 m.daN) and torque to the same value again.
(e)TORQUE the oil cooler inlet return manifold to between 220 and 225 lbf.in. (2.25 and 2.54 m.daN).
(f)Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety all the tubes torqued to the bottom of the fuel/oil cooler and the fuel/oil cooler bypass valve adapters.
NOTE : Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and the Safety Cable Ferrule (Material No.P05-292) to safety the forward inboard oil cooler inlet fuel tube to the forward outboard wire hole in bypass valve gasket.
(4)Install the main bearing strainer housing (Ref. 79-21-41, P. Block 401).

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

(5)Attach and connect the harnesses to the fuel/oil cooler and the fuel/oil cooler bypass valve (Ref. Fig. 407)
(a)Install two loop clamp brackets.
1 Remove the four bolts and washers from the front flange of the fuel/oil cooler.
2 Attach the two loop clamp brackets to the front flange with four

bolts, threads lubricated with Material No.P03-001. No washers.
3 TORQUE the bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (SEE 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(b) Connect the W3P5 and W5P5 harness connectors to the front and rear connectors respectively on the fuel/oil cooler bypass valve solenoid (Ref. 70-00-00, P. Block 201).

(c) Install the three bolts and two nuts, threads lubricate with Material No.P03-001, that attach the W3 and W5 harnesses to the brackets attached to the front of the cooler and to the bracket below the cooler. TORQUE the bolts and nuts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

D. Close-Up

(1) Install the oil quantity transmitter cooling tube assembly (Ref. 79-31-11, P. Block 401).

(2) Install the oil pressure switch tube assemblies (Ref. 79-21-04, P. Block 401).

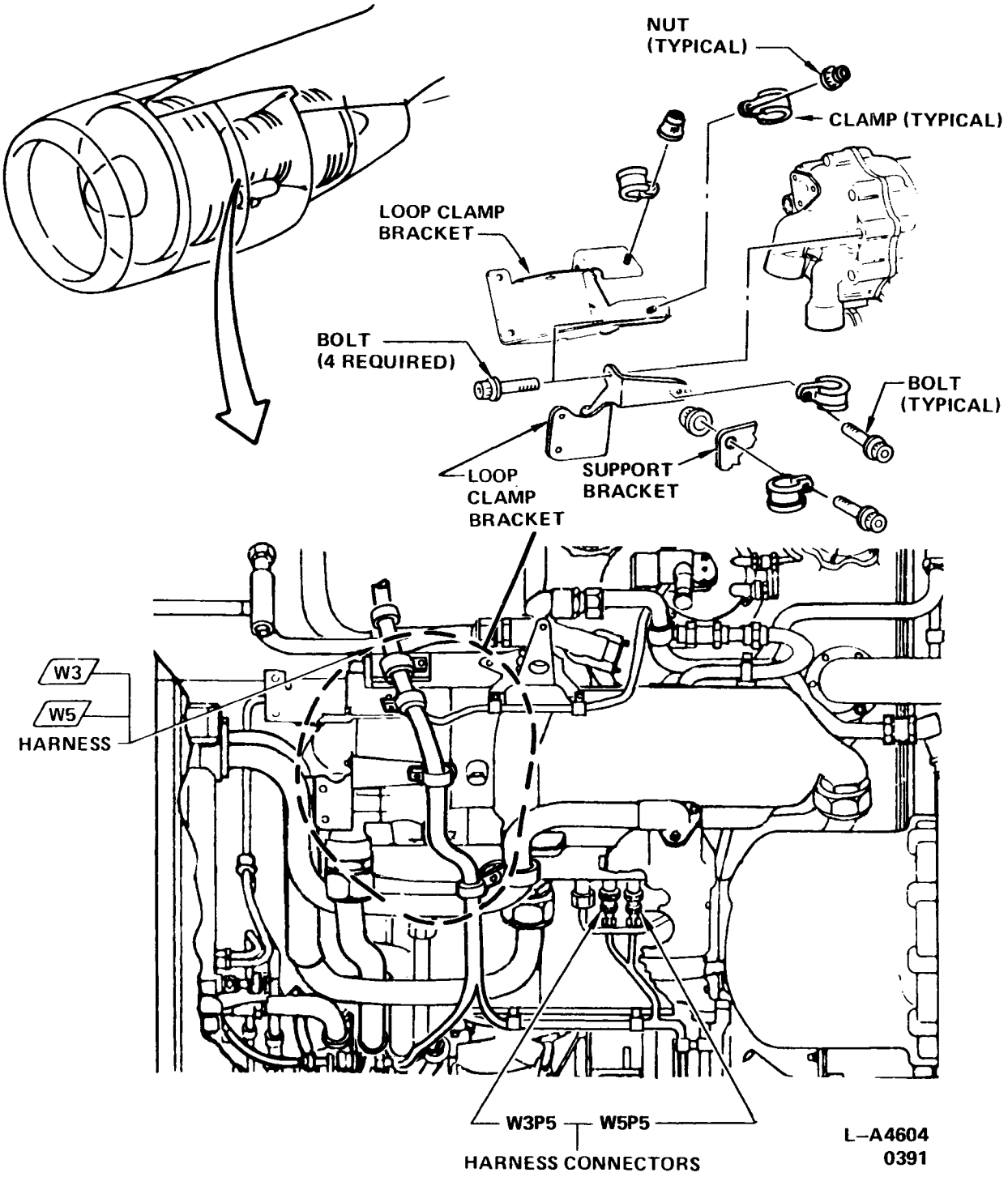
(3) Install the IDG oil cooler out tube assembly (Ref. 24-11-27, P. Block 401).

(4) On the appropriate FIRE control module, push the fire handle and remove the warning notice.

(5) Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.

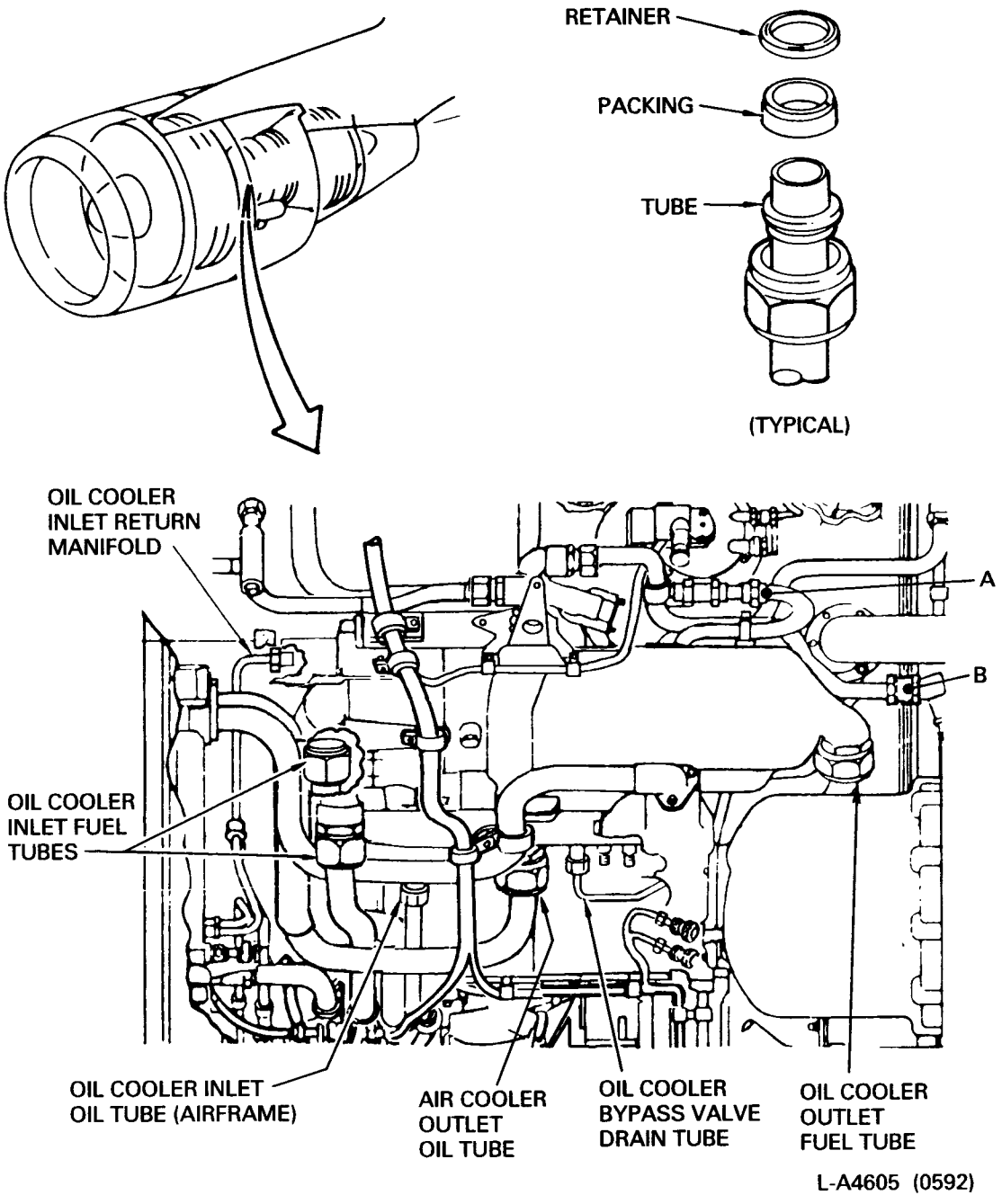
(6) Remove safety clips and tags and close circuit breakers 18KS, 19KS, 20KS and 21KS.

(7) Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



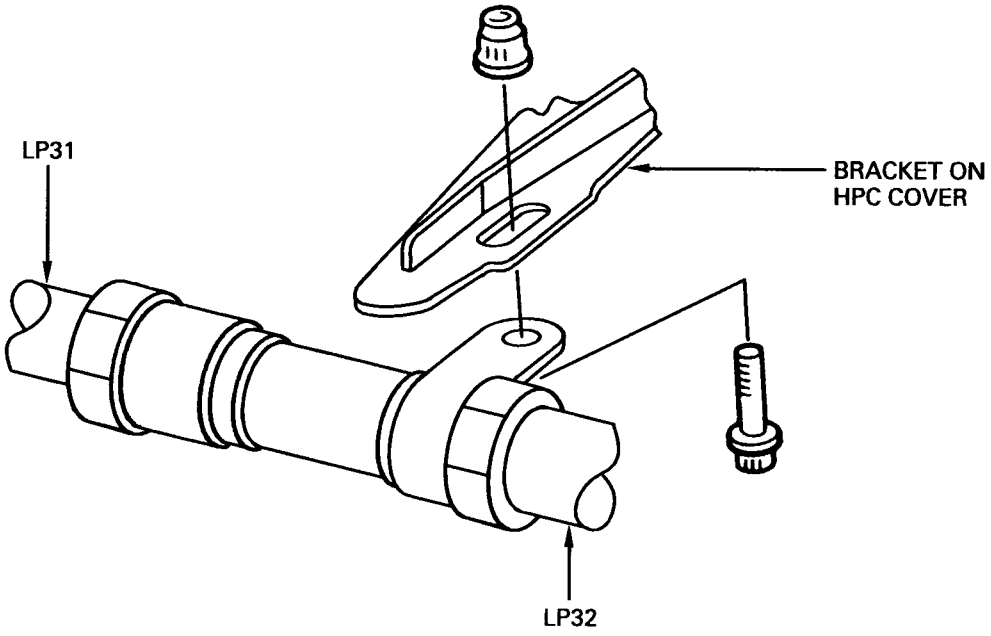
BM5 79 21 05 4 KRA0 00

EEC Wiring Harness and Support Brackets
Figure 407

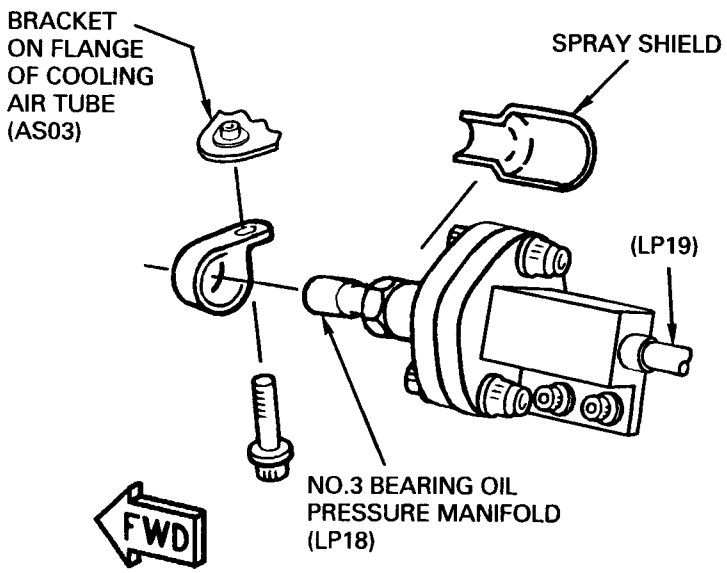


BM5 79 21 05 4 KRBA 00

Fuel/Oil Cooler Front and Bottom Tube Connection (Sheet 1/2)
Figure 408



VIEW A



VIEW B

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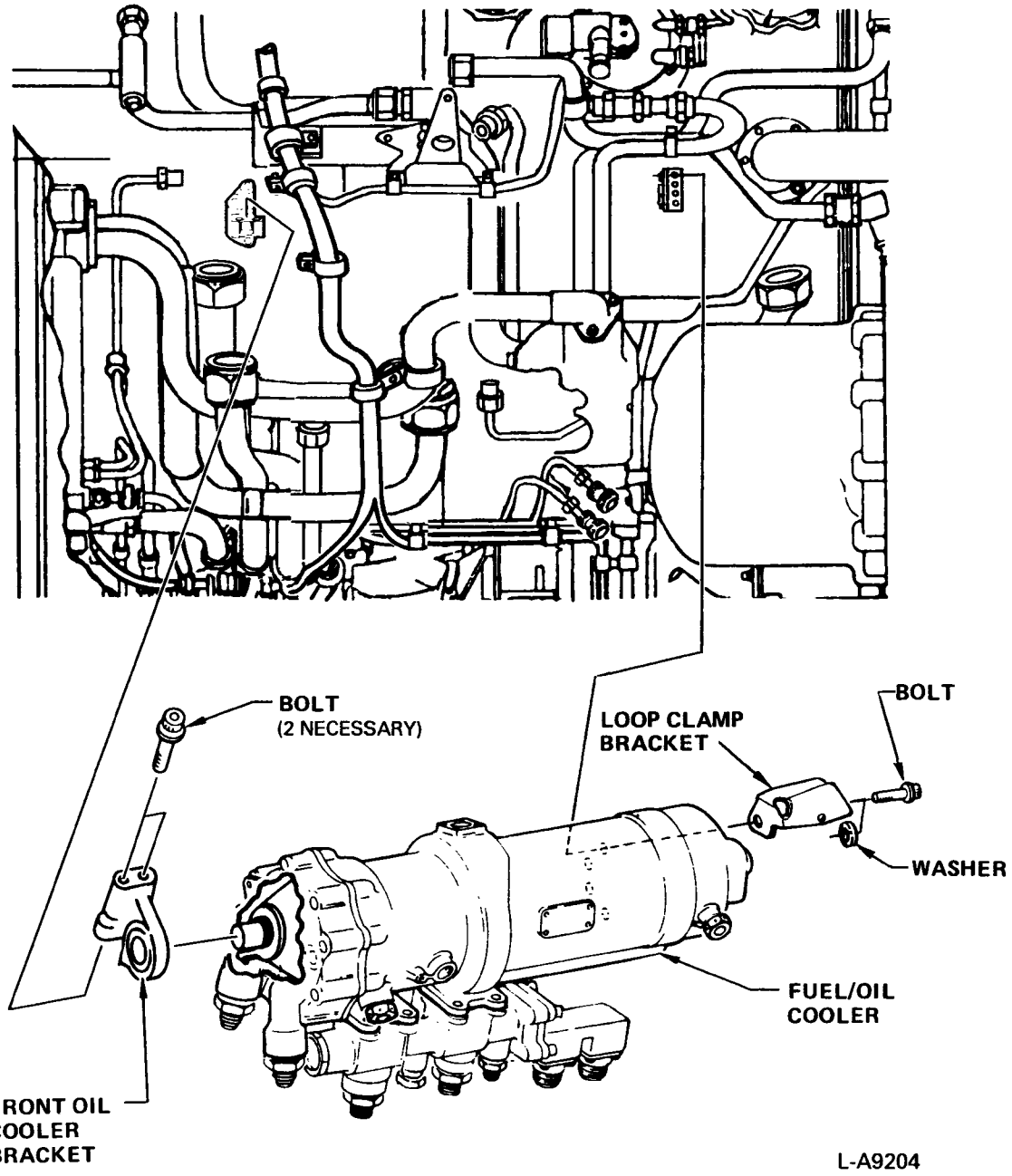
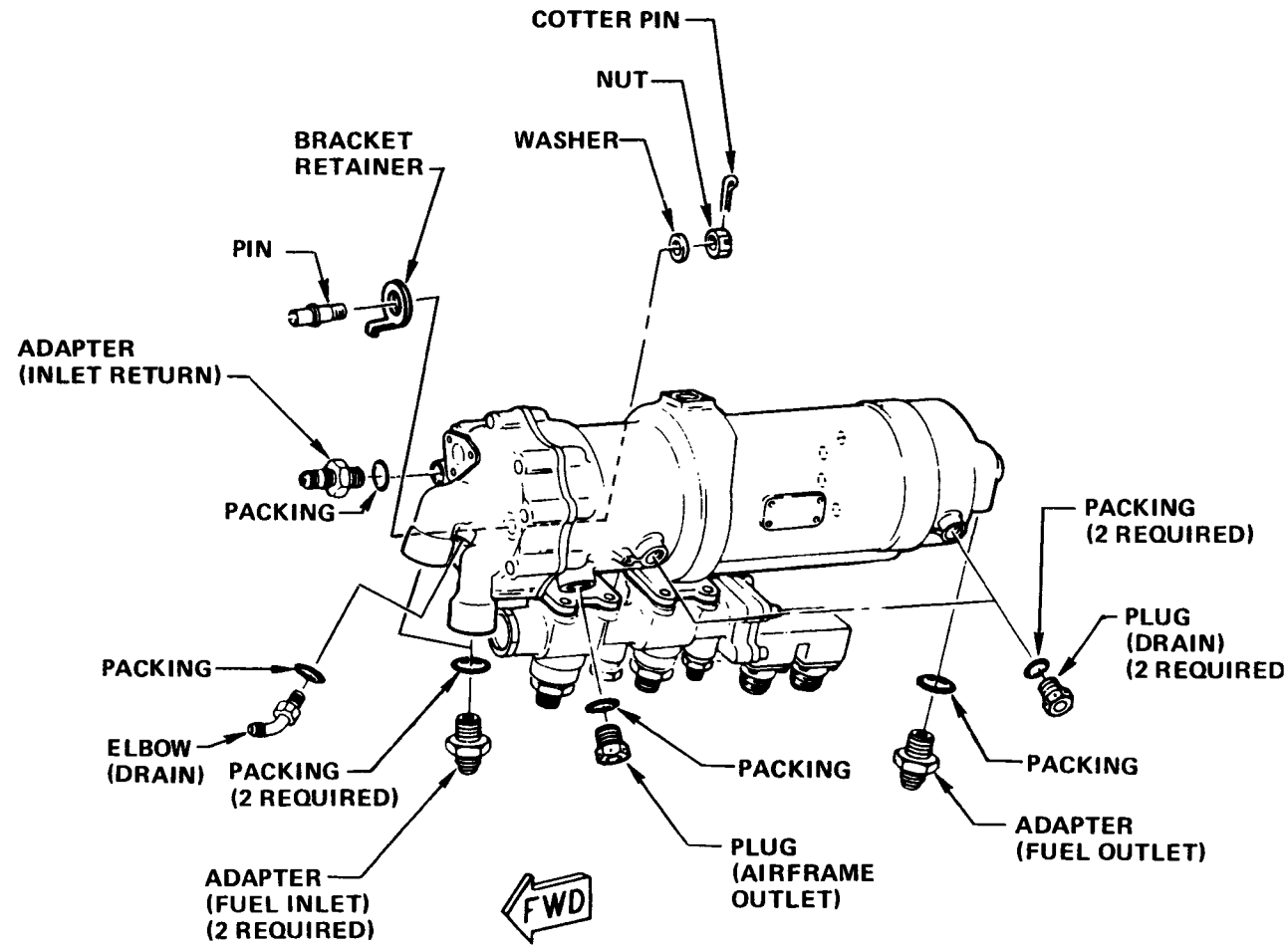
BM5 79 21 05 4 KRBB 00

Fuel/Oil Cooler Front and Bottom Tube Connection (Sheet 2/2)
Figure 408



BM5 79 21 05 4 KRDO 00

Fuel/Oil Cooler Front and Rear Mounts
Figure 409



BM5 79 21 05 4 KREO 00

Fuel/Oil Cooler Assembly
Figure 410

FUEL/OIL COOLER BYPASS VALVE - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P03-001	Oils (Ref. 70-00-00)
C.	Gasket
D.	Packings
E.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
F.	Torque Wrench

Referenced Procedures

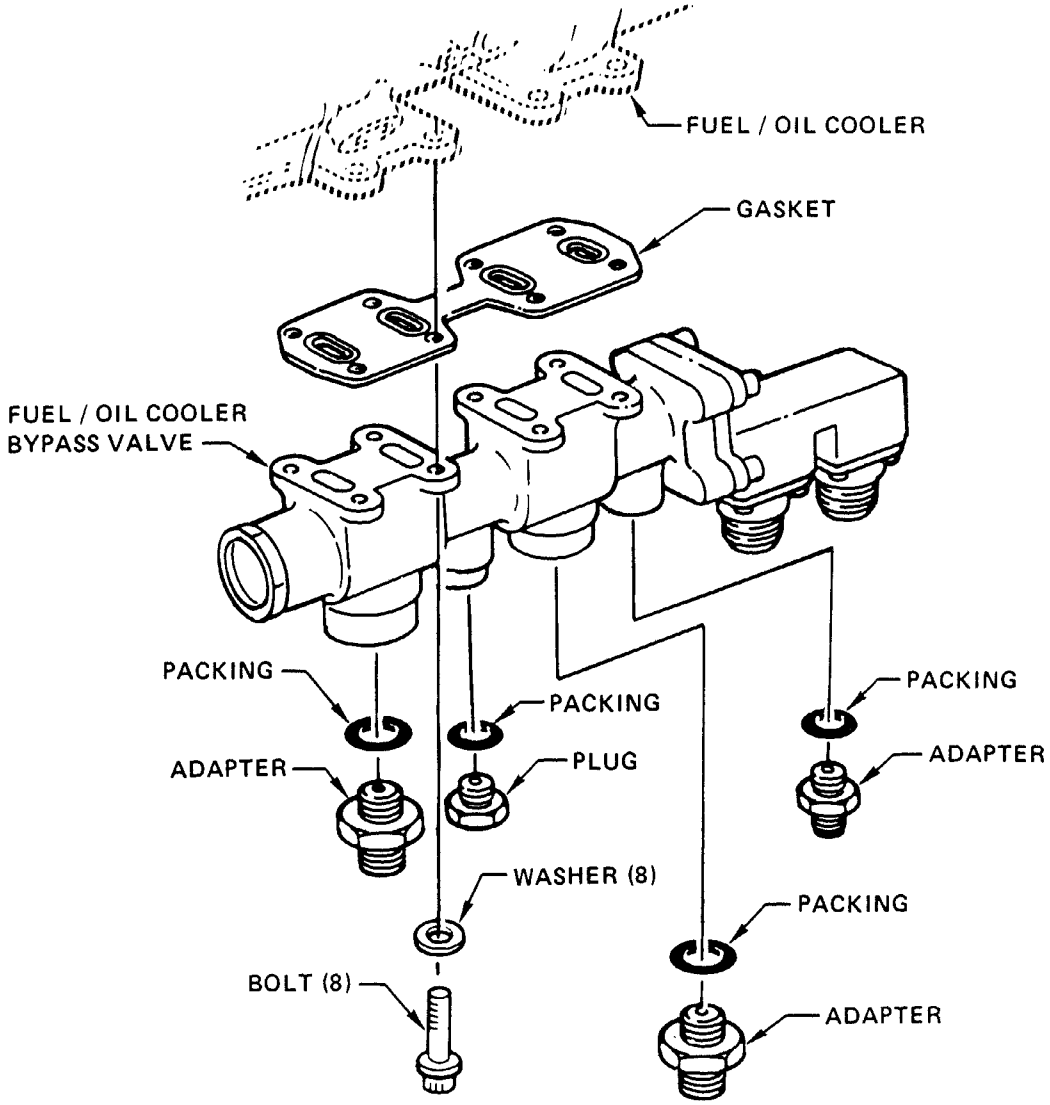
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 79-21-05, P. Block 401	Fuel/Oil Cooler

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove fuel/oil cooler (Ref. 79-21-05, P. Block 401).

B. Removal (Ref. Fig. 401)
(1)Remove bolts and washers securing bypass valve to fuel/oil cooler and remove valve. Remove and discard gasket.
(2)Install protective closures.
(3)If bypass valve is to be replaced comply with the following : (Ref. Fig. 401).
(a)Remove lockwire, plugs, and adapters from bypass valve.

C. Installation (Ref. Fig. 401)
(1)Remove protective closures
(2)If new valve assembly is being installed, install adapters and plugs as follows :
(a)Install new packing, lubricated with Material No.P03-001, to adapter and install adapter, threads lubricated with Material No.P03-001, to port (marked RET) adjacent to solenoid. TORQUE adapter to between 110 and 120 lbf.in. (1.24 and 1.35 m.daN).
(b)Install new packing, lubricated with Material No. P03-001, to adapter and install adapter, threads lubricated with Material No. P03-001, to port (marked ENG OIL) on bypass valve. TORQUE adapter to between 650 and 750 lbf.in. (7.34 and 8.47 m.daN).
(c)Install new packing, lubricated with Material No.P03-001, to plug and install plug, threads lubricated with Material No.P03-001, to small port (marked DRAIN) adjacent to oil inlet port. TORQUE plug to between 110 and 120 lbf.in. (1.24 - 1.35 m.daN). Wirelock plug.
(d)Install new packing, lubricated with Material No.P03-001, to adapter



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DM5

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Fuel/Oil Cooler Bypass Valve
Figure 401

and install adapter, threads lubricated with Material No.P03-001, to last open port (marked IDG OIL) on bypass valve. TORQUE adapter to between 375 and 425 lbf.in. (4.23 and 4.80 m.daN).

(e)Secure all adapters and plug with lockwire.

(3)Position gasket to bypass valve and position valve to fuel/oil cooler (solenoid to the rear) and secure with bolts, threads lubricated with Material No.P03-001 and washers. TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

D. Close-Up and Test

(1)Install fuel/oil cooler (Ref. 79-21-05, P. Block 401).

(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(3)Close thrust reverser and fan cowls doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.

(4)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

MAIN OIL FILTER PRESSURE RELIEF VALVE - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P03-001	Oils (Ref. 70-00-00)
C.	Packings
D.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
E.	Torque Wrench
F.	Container Minimum Capacity 5 U.S. Gallons (19 l)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-00-00, P. Block 501	Power Plant - General

2. Procedure

A. Job Set-Up
(1) Open, safety and tag the appropriate circuit breakers and open left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2) Disconnect filter to pressure switch tube and loosen clamping.

B. Removal (Ref. Fig. 401)
(1) Remove lockwire and remove main oil filter pressure relief valve from main oil filter housing. Discard packings.
WARNING : BEFORE DRAINING THE OIL FROM THE MAIN OIL FILTER HOUSING, PERMIT PRESSURE TO BLEED FROM THE OIL SYSTEM FOR A MINIMUM OF FIVE MINUTES AFTER THE ENGINE IS STOPPED. PRESSURE CAN SUDDENLY FORCE OUT HOT OIL ONTO YOU CAUSING BURNS.
NOTE : Be prepared to catch oil in a container with a minimum capacity of 5 U.S. Gallons (19 l).

C. Installation (Ref. Fig. 401)
(1) Install pressure relief valve assembly as follows :
(a) Install new packings, lubricated with oil, Material No.P03-001, in grooves of pressure relief valve assembly.
(b) Lubricate threads of valve with Material No.P03-001, and install pressure relief valve assembly in main oil filter housing. TORQUE valve to between 525 and 625 lbf.in. (5.93 and 7.96 m.daN) and wirelock.
(2) Connect filter pressure switch tube to restrictor in main oil filter housing and to union in oil filter differential pressure switch. TORQUE coupling nuts to between 135 and 150 lbf.in. (1.53 and 1.60m daN).
(3) Position clamps and secure with screws, washers and nuts. TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN.).

D. Test
(1) Perform leak test at idle power (Ref. 71-00-00, P. Block 501 - Test No. 3)

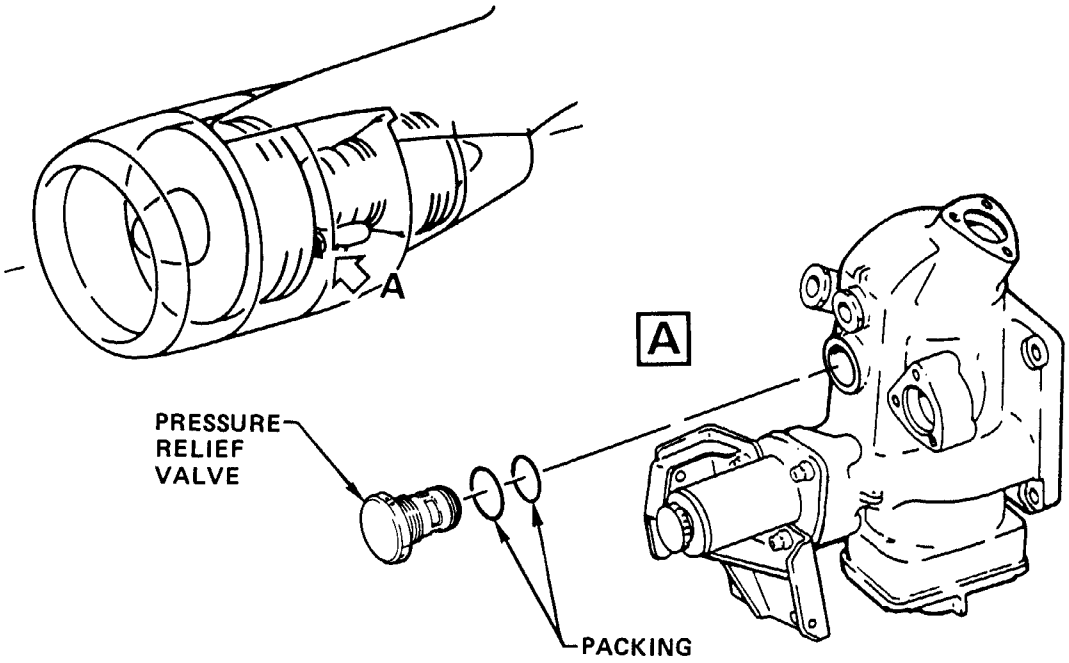
E. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close thrust reverser and fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

R **ON A/C 101-104,

R Post SB 72-2030 For A/C 101-104,

MAIN OIL FILTER PRESSURE RELIEF VALVE - REMOVAL/INSTALLATION

NOTE : A Dual Element Oil Filter is introduced by SB PW4ENG 72-525 which also replaces the pressure relief valve in the main oil filter housing with a plug. For Post SB PW4ENG 72-525 removal of the pressure relief valve and the replacement plug, Ref. 72-65-11, P. Block 401, or 79-21-03, P. Block 401.



BM5 79 21 08 4 KAMO - 23

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Main Oil Filter Pressure Relief Valve
Figure 401

LAST CHANCE STRAINERS ELEMENTS - REMOVAL/INSTALLATION

1. Equipment and Materials

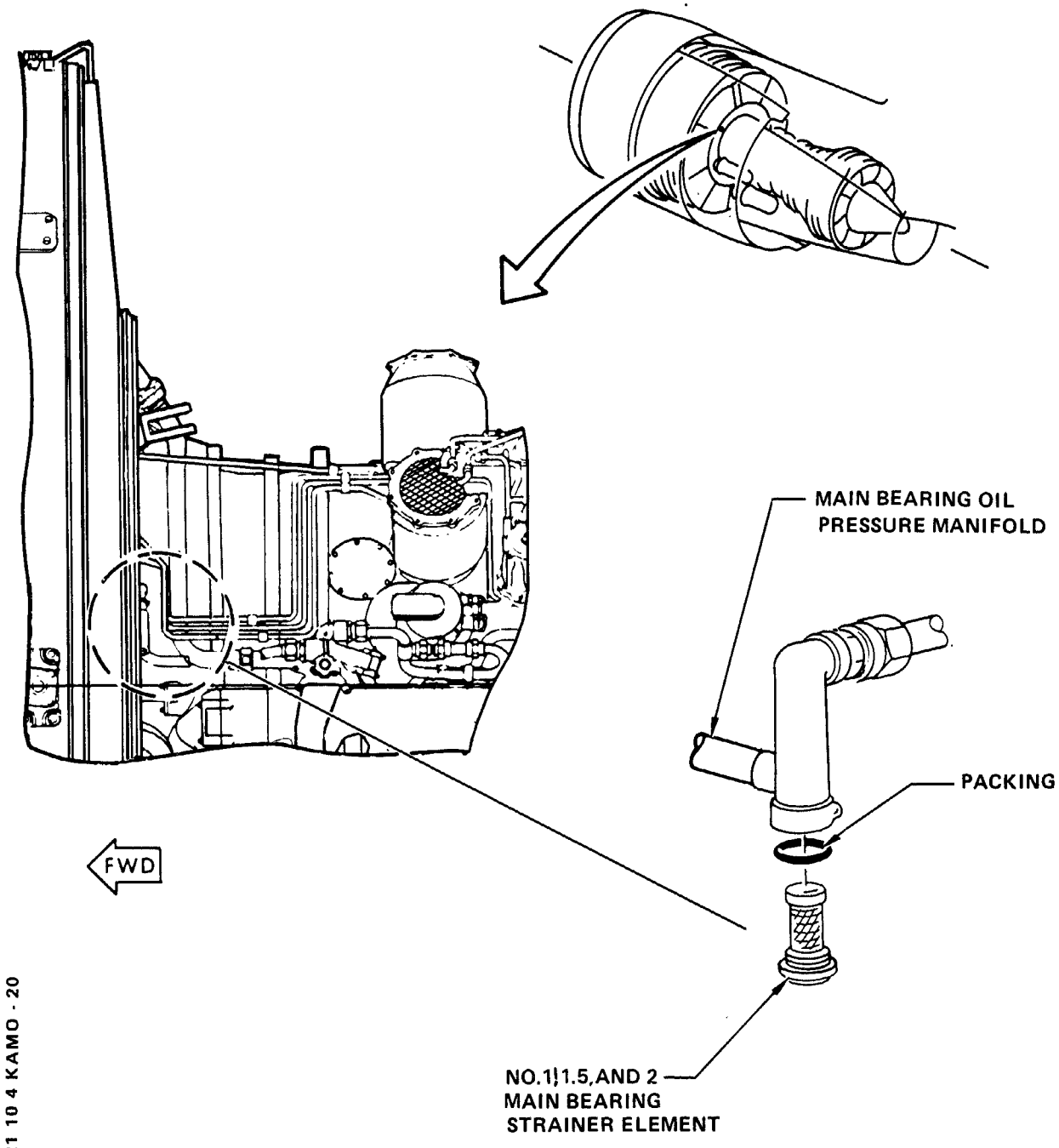
ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P03-001	Oils (Ref. 70-00-00)
C. PWA85518	Puller
D.	Packing
E.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
F.	Torque Wrench
G. Material No.P06-021	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-00-00, P. Block 201	Engine - General

2. No. 1, 1.5, and 2 Bearing Oil Pressure Strainer

A. Job Set-Up
(1) Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)
(1) Locate in line strainer on main bearing pressure manifold assembly on left side of engine protruding from intermediate case at approximately 9 o'clock position.
CAUTION : YOU MUST USE THE WRENCHING FLATS ON THE STRAINER HOUSING WHEN YOU LOOSEN OR TIGHTEN THE STRAINER. THIS WILL PREVENT ANY TWIST DAMAGE TO THE TUBES.
(2) Remove the lockwire from the strainer and the strainer housing. While you hold the strainer housing with a wrench, remove the strainer from the housing. Collect the oil.
(3) Remove and discard packing.
(4) Install protective closures.
(5) Inspect and clean strainer (Ref. 72-00-00, P. Block 201).

C. Installation (Ref. Fig. 401)
(1) Remove protective closures.
(2) Lubricate packing with Material No.P03-001, and install packing onto strainer.
CAUTION : YOU MUST USE THE WRENCHING FLATS ON THE STRAINER HOUSING WHEN YOU LOOSEN OR TIGHTEN THE STRAINER. THIS WILL PREVENT ANY TWIST DAMAGE TO THE TUBES.
(3) Lubricate the threads of the strainer with Material No.P03-001. Install the strainer to the No. 3 bearing oil strainer housing and tighten by hand. While you hold the strainer housing with a wrench, TORQUE the strainer to between 275 and 300 lbf.in. (3.11 and 3.38 m.daN) and wire-lock.



No. 1, 1.5 and 2 Bearing Oil Pressure Strainer
Figure 401

D. Close-Up and Test
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags, and close circuit breakers.
(3)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

3. Angle and Main Gearbox Strainer

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 402)
(1)Locate angle and main gearbox strainer on left side of engine in housing mounted on top of fuel oil cooler.
(2)Remove bolts securing strainer and remove strainer from housing using PWA85518 Puller. Collect residual oil.
(3)Remove and discard packing.
(4)Install protective closures.
(5)Inspect and clean strainer (Ref. 72-00-00, P. Block 201).

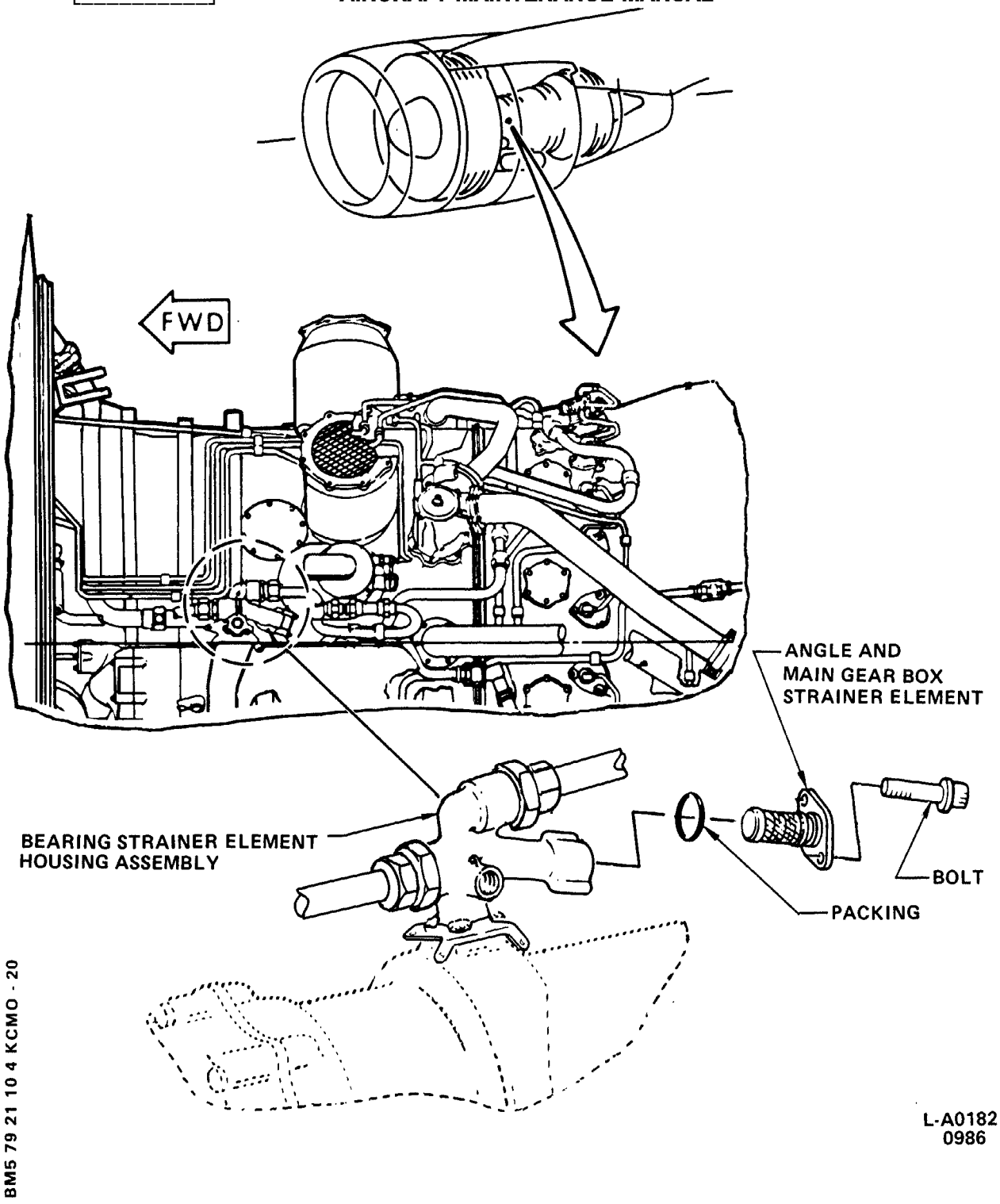
C. Installation (Ref. Fig. 402)
(1)Remove protective closures.
(2)Lubricate packing with Material No.P03-001, and install packing to groove at base of strainer.
(3)Install strainer to main bearing strainer element housing assembly and secure in place with bolts, threads lubricated with Material No.P03-001. TORQUE bolts to between 85 and 95 lbf.in. (0.96 - 1.07 m.daN).

D. Close-Up and Test
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.
(3)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

4. No. 3 Bearing Oil Pressure Strainer

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers, and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Pre SB PW4ENG 79-52) (Ref. Fig. 403)
(1)Locate in line strainer on No. 3 bearing oil pressure manifold on left side of engine, rearward of fuel/oil cooler.
(2)Remove lockwire securing strainer and remove strainer from manifold. Collect residual oil.
(3)Remove and discard packing.
(4)Install protective closures.
(5)Inspect and clean strainer (Ref. 72-00-00, P. Block. 201).

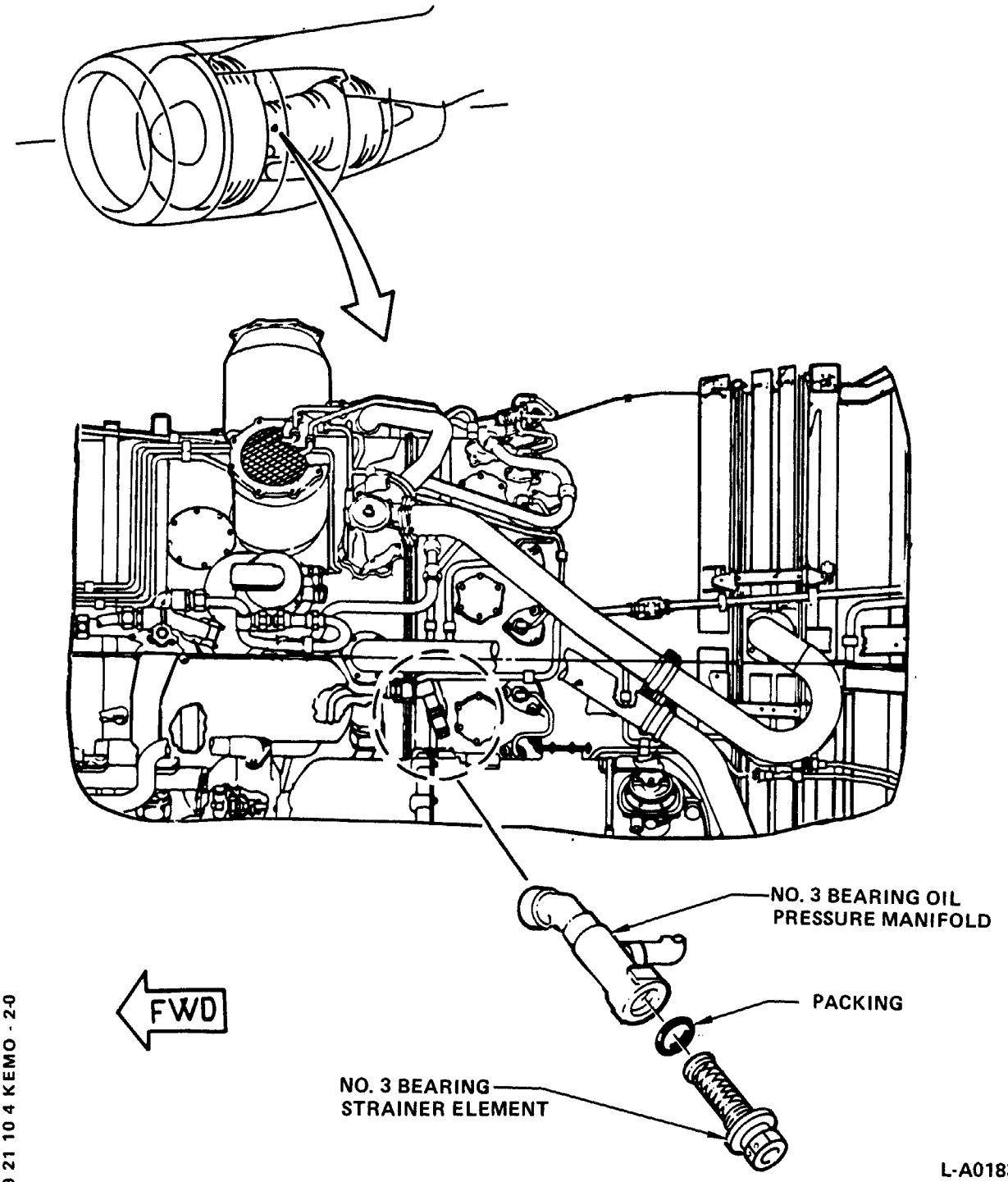


Angle and Main Gearbox Strainer
Figure 402

C. Removal (Post SB PW4ENG 79-52) (Ref. Fig. 404)
(1)Remove the bolt from the clamp that attaches the No. 3 bearing oil pressure manifold (LP18) and spray shield to a bracket on the high compressor at approximately the 9 o'clock position. Remove the bolt, clamp and spray shield.
(2)Remove the lockwire and disconnect the manifold nut (LP18) from the adapter in the No. 3 bearing oil pressure tube (LP19). Collect the oil.
(3)Remove the bolts that attach the ferrule end of the tube (LP19) to a bracket on Flange K.
(4)Remove the lockwire from the bolts that attach the adapter and a strainer into the ferrule end of tube (LP19). Remove the bolts and nuts from the adapter.
(5)Remove a nut and bolt that attach clamps together on the oil trim pressure tube (LP32) and the No. 3 bearing oil pressure manifold (LP18). The clamps are located just above the fuel/oil cooler. The clamps can stay with the tube and manifold.
CAUTION : YOU MUST USE THE FLATS ON THE MATING PARTS WHEN YOU LOOSEN MANIFOLDS AND TUBES.
THIS WILL PREVENT ANY TWISTS DAMAGE TO THE TUBES.
(6)Remove the lockwire from the tube nuts on the oil trim pressure tube (LP31) and disconnect the tube nuts.
(7)Remove the lockwire from the tube nut on the No. 3 bearing oil pressure manifold (LP18) that is attached to the bearing strainer element housing on top of the fuel/oil cooler. Remove the retainer and packing and discard. Remove the oil trim pressure tube (LP31).
(8)With the No. 3 bearing oil pressure manifold loosened sufficiently, remove the adapter from the ferrule end of No. 3 bearing oil pressure tube (LP19). Remove the packing from the adapter.
(9)Remove the strainer from the ferrule end of tube (LP19).
(10)Install protective closures.
(11)Inspect and clean strainer (Ref. 72-00-00, P. Block 201).

D. Installation (Pre SB PW4ENG 79-52) (Ref. Fig. 403)
(1)Remove protective closures.
(2)Lubricate packing with Material No.P03-001, and install packing onto strainer.
(3)Lubricate threads of strainer with Material No.P03-001 and install strainer to housing on No. 3 bearing oil pressure manifold assembly. TORQUE strainer to between 275 and 300 lbf.in. (3.10 - 3.89 m.daN) and secure with lockwire.

E. Installation (Post SB PW4ENG 79-52) (Ref. Fig. 404, 405)
(1)Remove protective closures.
(2)Install the strainer to the ferrule end of the No. 3 bearing oil pressure tube (LP19).
(3)Install a packing, lubricated with Material No.P03-001, to the adapter. Install the adapter to the ferrule end of the No. 3 bearing oil pressure tube (LP19). Attach the adapter to the tube with bolts, threads lubricated with Material No.P03-001, and nuts.
(4)TORQUE the nuts that attach the adapter to the ferrule end of the tube (LP19) to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN). Install



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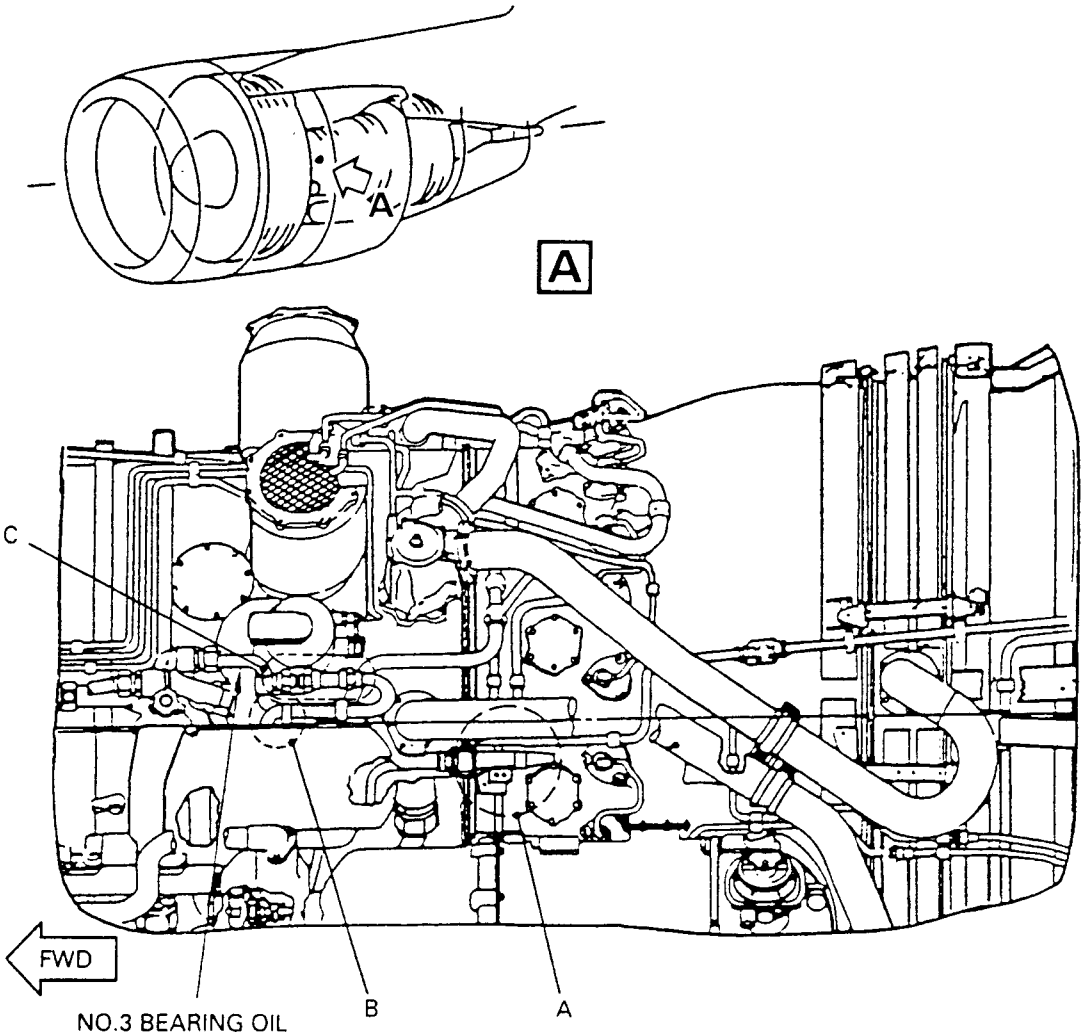
No. 3 Bearing Oil Pressure Strainer
(Pre SB PW4ENG 79-52)
Figure 403



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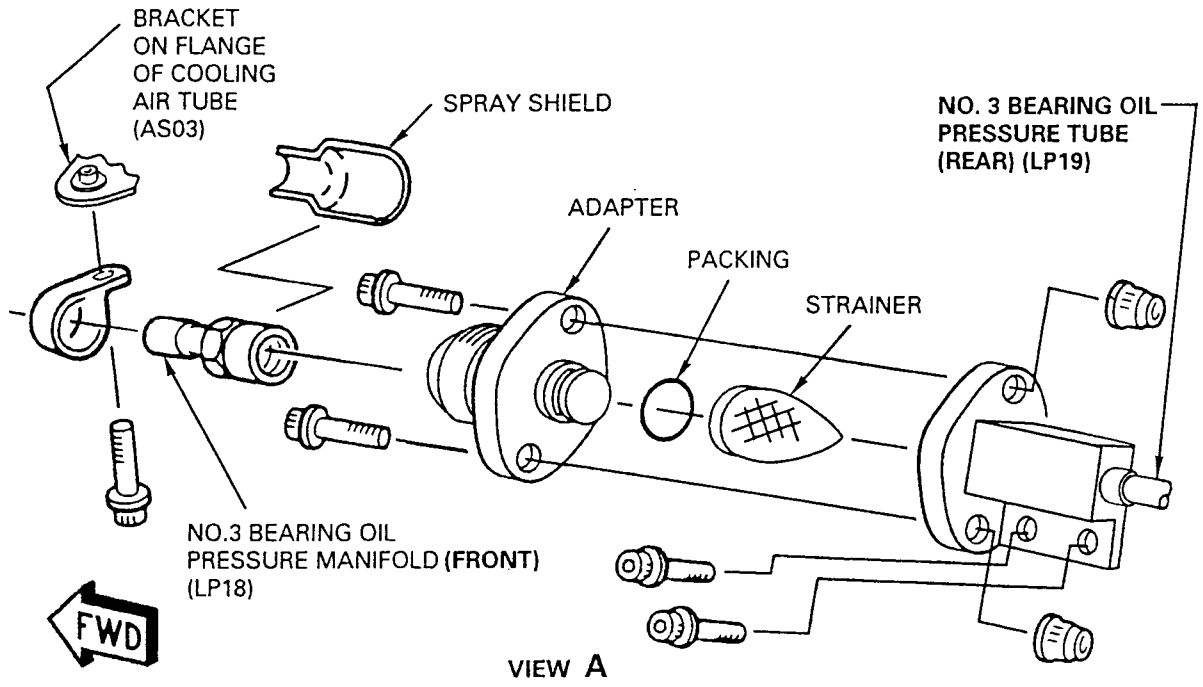
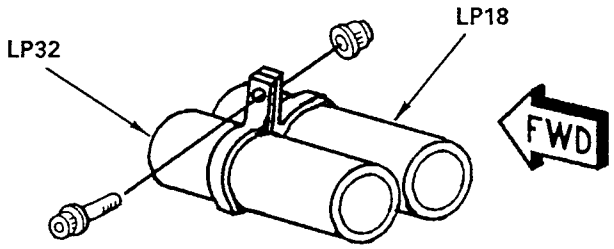
No. 3 Bearing Oil Pressure Strainer
(Post SB PW4ENG 79-52) (Sheet 1/3)
Figure 404



VIEW A



VIEW B

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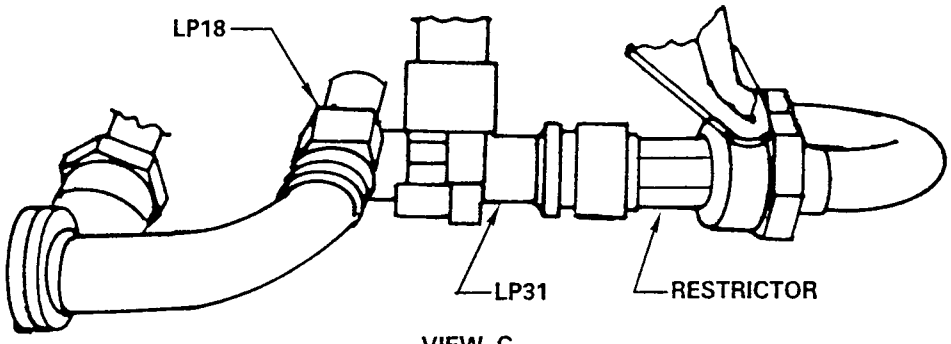
BM5 79 21 10 4 KJMJ - 00

No. 3 Bearing Oil Pressure Strainer
(Post SB PW4ENG 79-52) (Sheet 2/3)
Figure 404



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No. 3 Bearing Oil Pressure Strainer
(Post SB PW4ENG 79-52) (Sheet 3/3)
Figure 404

lockwire to the bolts.

(5)Install the oil pressure trim tube assembly (LP31) as follows.
  (a)Lubricate the tube nuts with Material No.P06-021.
  (b)Install the trim tube to the oil metering nipple (restrictor). Tighten the tube nut by hand.

(6)Connect the manifold nuts on the No. 3 bearing oil pressure manifold (LP18) as follows.
  (a)Lubricate the manifold nut threads and manifold ferrules with Material No.P06-021 (Ref. Fig. 405).
  (b)Lubricate a packing with Material No.P03-001 and install the packing and retainer to the front of the manifold.
  (c)Connect the front manifold nut to the rear of the strainer housing on the fuel/oil cooler. Tighten the manifold nut by hand.
  (d)Tighten the nut on the oil pressure trim tube (LP31) to the manifold tee (LP18) by hand.
  (e)Connect the rear manifold nut (LP18) to the adapter in the No. 3 bearing oil pressure tube (LP19) located at the 9 o'clock position. Tighten the manifold nut by hand.

(7)Attach the ferrule end of the No. 3 bearing oil pressure tube (LP19) to the bracket on Flange K with two bolts, threads lubricated with Material No.P03-001. TORQUE the bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(8)Adjust the forward tube clamp on the oil trim pressure tube (LP32) and the clamp on the No. 3 bearing oil pressure manifold (LP18) so that center of the forward clamp (on the oil trim pressure tube) is 2.5 - 3.0 in. (6.35 - 7.62 mm) from the center of the rear clamp (Post SB PW4ENG 72-211).

(9)Attach the clamps together with a bolt, threads lubricated with Material No.P03-001, and a nut. TORQUE the bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

CAUTION : YOU MUST USE THE FLATS ON THE MATING PARTS WHEN YOU TIGHTEN MANIFOLDS AND TUBES. THIS WILL PREVENT ANY TWISTS DAMAGE TO THE TUBES.

(10)Torque the manifold nuts on the No. 3 bearing oil pressure manifold (LP18) as follows.
  (a)TORQUE the front manifold nut that is attached to the strainer housing on the fuel/oil cooler to between 140 and 160 lbf.in. (1.58 and 1.81 m.daN) then loosen and torque again to the same value.
  (b)TORQUE the rear manifold nut to the adapter in the No. 3 bearing oil pressure tube (LP19) to between 675 and 750 lbf.in. (7.63 and 8.47 m.daN).
  (c)Install lockwire to the manifold nuts.

(11)Torque the tube nuts on oil trim pressure tube (LP31) as follows.
  (a)TORQUE the front tube nut that is attached to the manifold tee (LP18) to between 675 and 750 lbf.in. (7.63 and 8.47 m.daN).
  (b)TORQUE the tube nut that is attached to the oil tube metering nipple (restrictor) to between 675 and 750 lbf.in. (7.63 and 8.47 m.daN).
  (c)Install lockwire to the tube nuts.

(12)At the rear of the No. 3 bearing oil pressure manifold (LP18), install a spray shield to the inboard side of the manifold. Attach the spray shield with a clamp and a bolt, threads lubricated with Material No.P03-001, to

a bracket that is attached to the flange of the cooling air tube on the high compressor. TORQUE the bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

D. Close-Up and Test
(1)Make certain that working area is clean and clear of tools and miscellaneous of items equipment.
(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.
(3)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

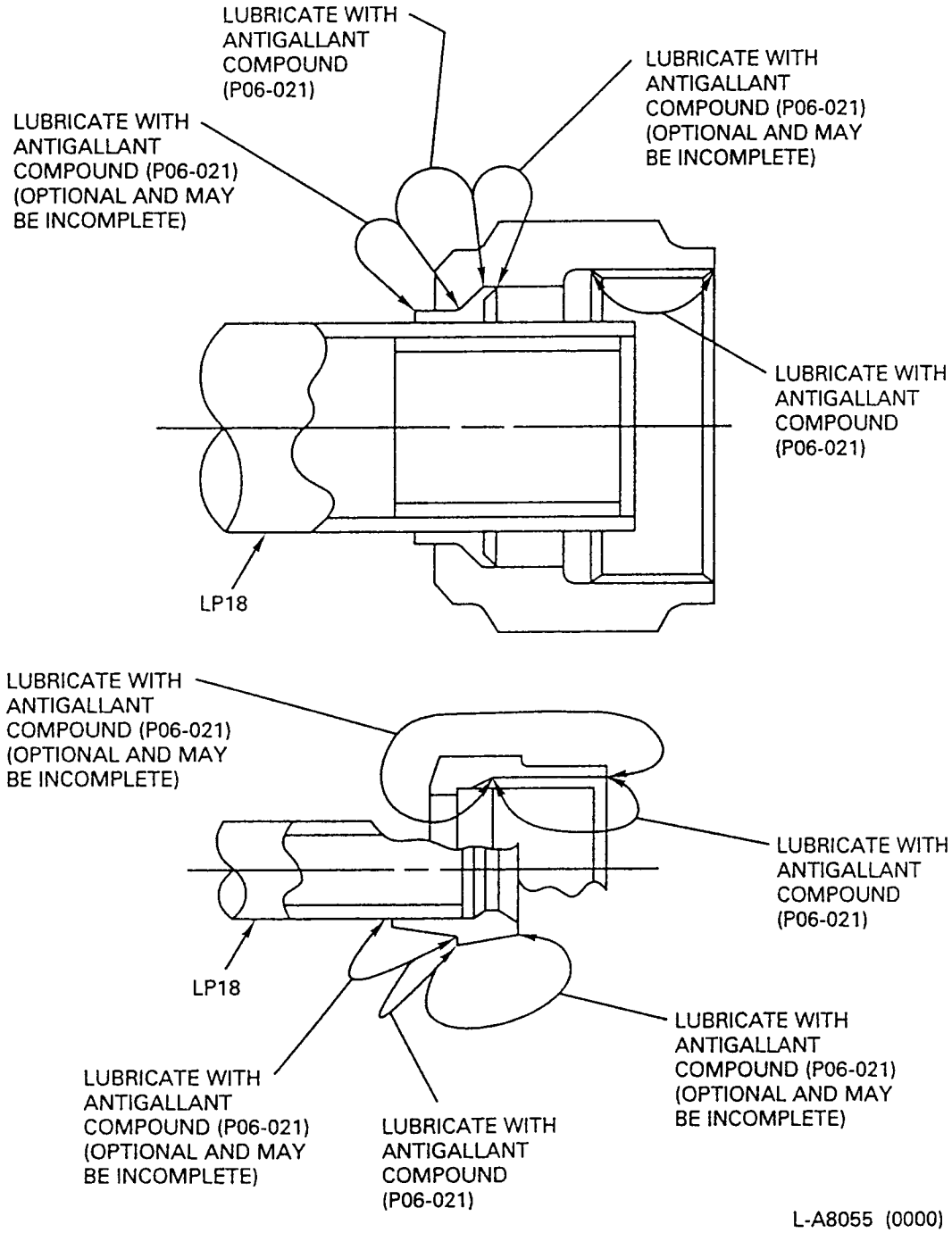
5. No. 4 Bearing Oil Pressure Strainer

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 406)
R (1)Remove lockwire or the safety cable securing strainer element to
R strainer housing at approximately 10:30 o'clock (Pre SB PW4ENG 79-76)
R or approximately 7:00 o'clock (Post SB PW4ENG 79-76) position on exhaust case.
(2)Remove strainer from housing. Collect residual oil.
(3)Remove and discard packing. Install protective closures.
(4)Inspect and clean strainer (Ref. 72-00-00, P. Block 201).

C. Installation (Ref. Fig. 406)
(1)Remove protective closures and install packing lubricated with Material No.P03-001 to strainer element.
(2)Install strainer element, threads lubricated with Material No.P03-001, to
R strainer housing at approximately 10:30 o'clock (Pre SB PW4ENG 79-76)
R or approximately 7:00 o'clock (Post SB PW4ENG 79-76) position on exhaust case.
(3)TORQUE strainer to between 150 and 170 lbf.in. (1.70 and 1.92 m.daN) and secure with lockwire.

D. Close-Up and Test
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.
(3)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).


LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021)
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021) (OPTIONAL AND MAY BE INCOMPLETE)
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021) (OPTIONAL AND MAY BE INCOMPLETE)
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021)
LP18
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021) (OPTIONAL AND MAY BE INCOMPLETE)
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021)
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LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021) (OPTIONAL AND MAY BE INCOMPLETE)
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021) (OPTIONAL AND MAY BE INCOMPLETE)
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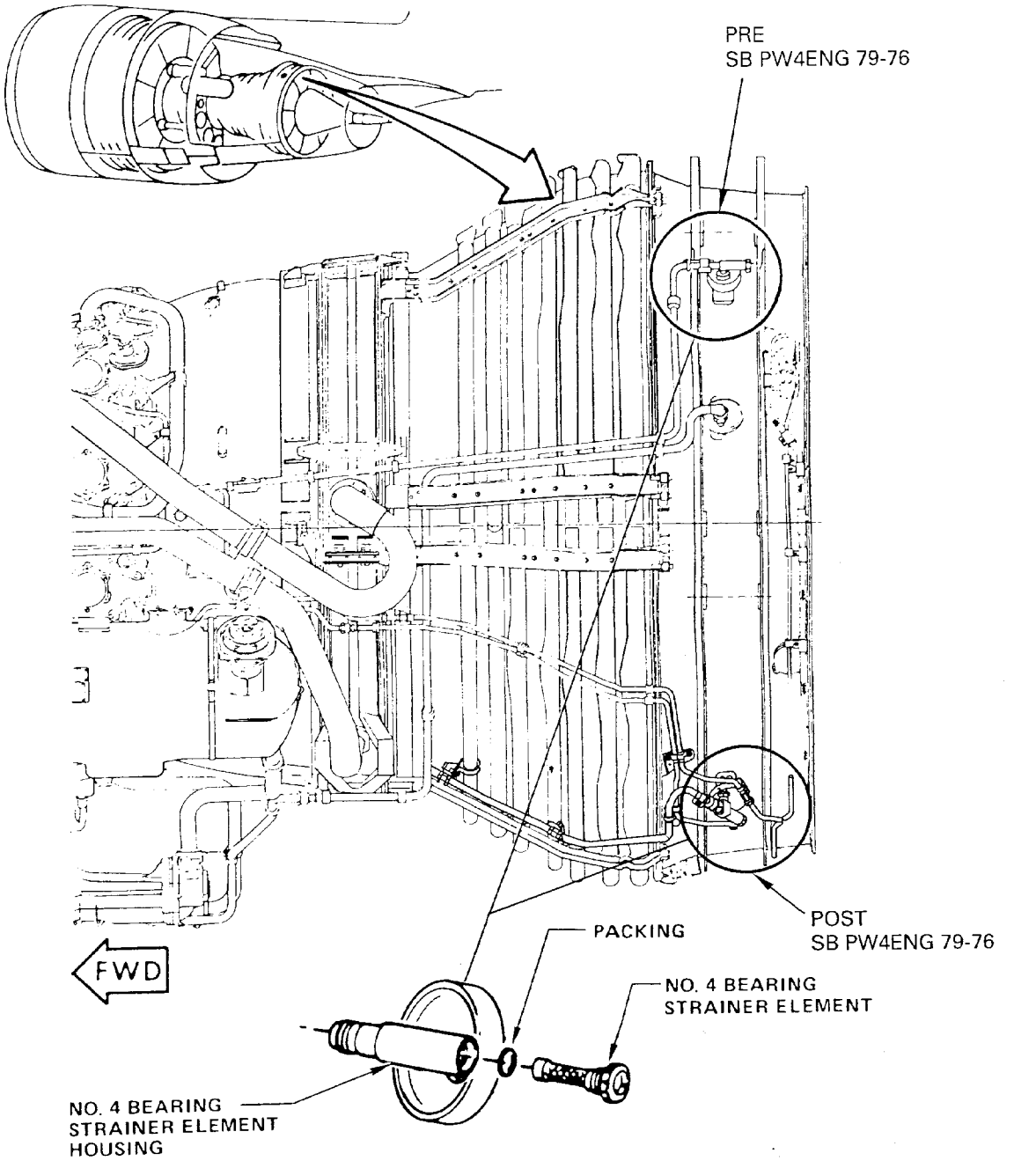
Application of Antigallant on Manifold Ferrules and Nuts
Figure 405



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R No. 4 Bearing Oil Pressure Strainer
Figure 406

FUEL/OIL COOLER BYPASS VALVE SOLENOID - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clip
B. Material No.P03-001	Oils (Ref. 70-00-00)
C. Material No.P06-002	Lubricants (Ref. 70-00-00)
D.	Packing
E.	Torque Wrench
F.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine Standard Practices
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL A	19KS	332/U70
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL A	18KS	332/U71
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL B	20KS	331/V69

(2)Open left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(3)Disconnect filter depressure switch inboard tube and loosen clamping.

B. Removal (Ref. Fig. 401)

(1)Disconnect W3P5 and W5P5 harness connectors from fuel/oil cooler bypass valve solenoid. Install protective closures.

(2)Remove screws and washers securing solenoid to fuel/oil cooler bypass valve.

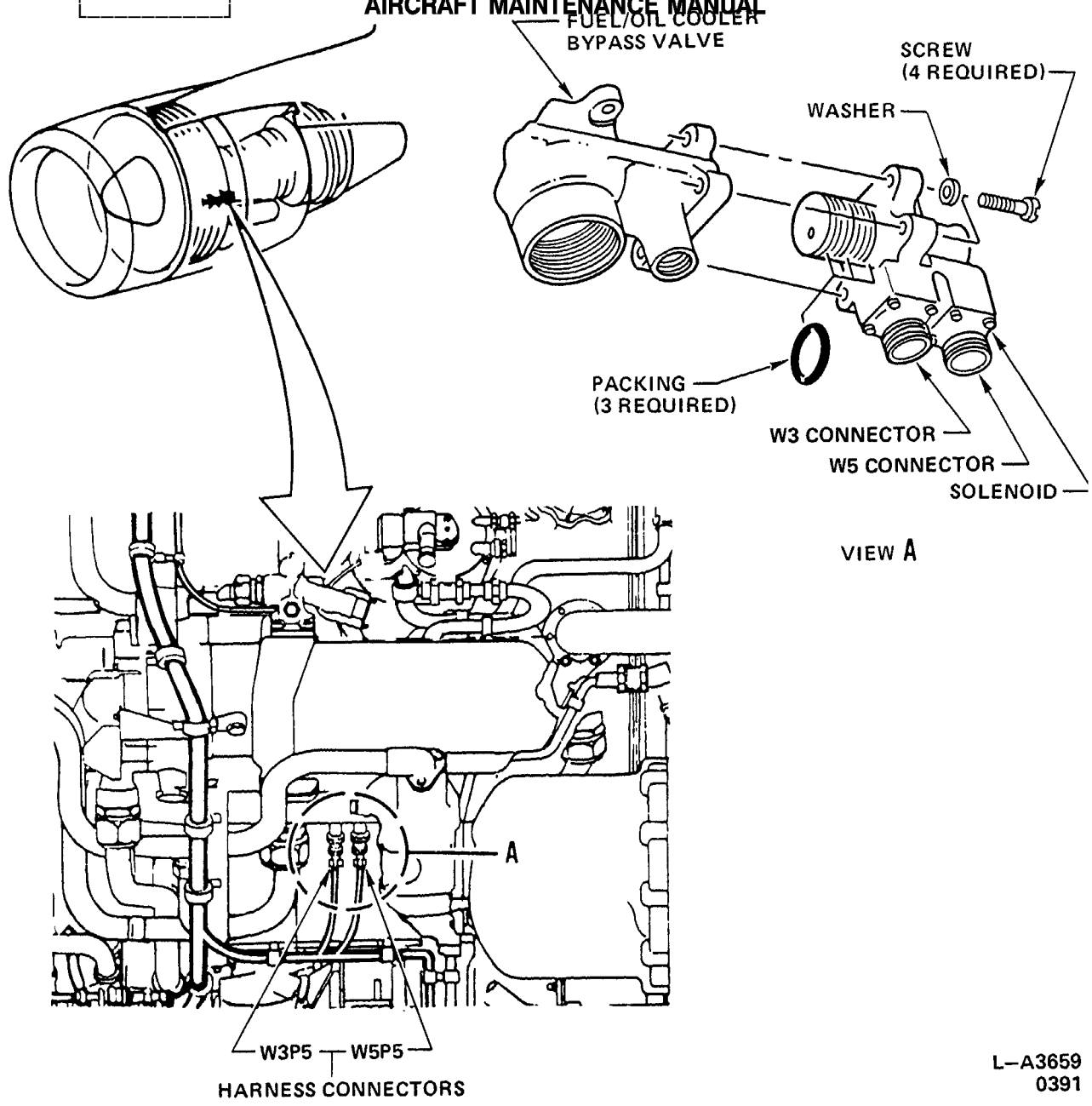
(3)Separate solenoid from cooler bypass valve. Discard packings.

C. Installation (Ref. Fig. 401)

(1)Install packings lubricated with Material No.P06-002, to fuel/oil cooler bypass valve solenoid.

(2)Install solenoid to rearward end of fuel/oil cooler bypass valve, with electrical connectors facing downward, and secure with screws, threads lubricated with Material No.P03-001 and washers. TORQUE screws to between 60 and 80 lbf.in. (0.68 and 0.90 m.daN).

(3)Remove protective closures. Connect W5P5 and W3P5 harness connector to front and rear connectors, respectively, on fuel/oil cooler bypass valve



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Fuel/Oil Cooler Bypass Valve Solenoid
Figure 401

solenoid.

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(4)Connect filter depressure switch tube to restrictor in main oil filter housing and to union in oil filter differential pressure switch. TORQUE coupling nuts to between 135 and 150 lbf.in. (1.53 and 1.60 m.daN).
(5)Position clamp and secure with screw, washer and nut. TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(3)Remove safety clips and tags and close circuit breakers : 19KS, 21KS, 18KS, 20KS.
(4)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

AIR/OIL HEAT EXCHANGER AND VALVE (ENGINE) - REMOVAL/INSTALLATION

1. Air/Oil Heat Exchanger and Valve

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)	Packings
(3)	Retainer
(4)PWA85853	Torque Adapter
(5)PWA87506	Protective Cover
(6)	Container Minimum Capacity of 5 US Gallons (19 liters)
(7)	Bergen Mechanical Crimper (optional) Model M303, M305 or M307
(8)Material No.P03-001	Oils (Ref. 70-00-00)
(9)Material No.P05-289	Special Materials (Ref. 70-00-00)
10)Material No.P05-291	Special Materials (Ref. 70-00-00)
11)Material No.P05-292	Special Materials (Ref. 70-00-00)
12)Material No.P06-002	Lubricants (Ref. 70-00-00)
R 13)Material No.P06-054	Lubricants (Ref. 70-00-00)
14)Material No.P06-015	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - General
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-05, P. Block 401	Fan Exit Liner Segments

B. Procedure

(1)Job set-up

(a)On the FIRE control module (overhead panel) of the engine concerned pull the fire handle and install a warning notice to prohibit actuation in normal position (pushed) while maintenance is in progress.

(b)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL A	19KS	332/U70
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL A	18KS	332/U71
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL B	20KS	331/V69

(c)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

CAUTION : DO NOT HANDLE HEAT EXCHANGER VALVE AND HEAT EXCHANGER BY INLET COLLARS. INLET COLLARS ARE NOT INTEGRAL PARTS OF VALVE HOUSING.

(d)Remove the fan exit liner segment (inner rear) that is at 8 o'clock

(Ref. 72-23-05, P. Block 401).

(2)Removal (Ref. Fig. 401, 402)

(a)Disconnect W3P17 harness connector from air/oil heat exchanger cable connector. Install protective closure on harness connector.

(b)Remove two bolts (20) and harness bracket securing valve cable connector receptacle to bracket on HPC case. Remove receptacle from bracket and install protective closure.

(c)Remove lockwire or safety cable and disconnect air/oil cooler valve hydraulic tube (CP07) (18) and air/oil cooler valve hydraulic return tube (CR05) (19) from the heat exchanger adapters.

NOTE : (Pre SB PW4ENG 79-50) Hold bulkhead adapters with wrench while loosening tube nuts at heat exchanger.

(d)If necessary, remove the air/oil cooler valve hydraulic tube assembly (CP07) (18) and air/oil cooler valve return tube assembly (CR05) (19) as follows.

1 Remove the clamp and bolt which attaches the tube (CP07) to the Flange E bracket.

2 While you hold the wrench flats, remove the lockwire and disconnect the (CP07) tube nut from the tee on manifold (CP02).

3 While you hold the wrench flats, remove the lockwire and disconnect the (CR05) tube nut from the tee on manifold (CR04).

(e)Remove air cooler inlet oil tube (29).

1 Remove bolt and nut securing W3/W5 harness clamp to bracket attached to air cooler inlet oil tube.

2 Remove bolts securing tube flange to air cooler. See View E

3 Remove three bolts securing other end of tube to oil filter housing. Disengage tube and discard packings. Install protective closures.

(f)Disconnect air cooler outlet oil hose and tube assembly (28).

1 Remove bolts securing tube flange to air cooler.

2 Disengage tube and discard packing. Install protective closures.

(g)Remove bolt (16), securing cable conduit to lower bracket (11) on intermediate case.

(h)Remove bolt (14) securing rear end of cable conduit to lower bracket (11) on intermediate case.

(j)(Pre SB PW4ENG 79-60), Remove the four outboard bolts (23) and washers (24), and loosen the four inboard bolts (23) as follows.

1 Remove the four outboard bolts (23) and washers (24) that attach the valve inlet collars to the rear of the intermediate case.

2 Use PWA 85853 torque adapter to loosen the four inboard bolts and washers that attach the valve inlet collars to the rear of the intermediate case. Do not remove the inboard bolts and washers from the intermediate case.

NOTE : The four bolt holes in the valve inlet collars are slotted to make easier the removal of the exchanger and valve.

(k)(Post SB PW4ENG 79-60), Remove the four outboard bolt and washer assemblies, and loosen the four inboard bolt and washer assemblies from the valve inlet collars as follows.

1 Remove the four outboard bolt and washer assemblies that attach the valve inlet collars to the rear of the intermediate case.

2 Use PWA 85853 torque adapter to loosen the four inboard bolt and washer assemblies that attach the valve inlet collars to the rear of

the intermediate case. Do not remove the inboard bolt and washer assemblies from the intermediate case.

NOTE : The washers are captive (part of) of the washer and bolt assembly.

NOTE : Four inboard bolt holes in valve inlet collars are slotted to facilitate exchanger and valve removal.

(l)Remove two bolts (8) and washers (7) securing bracket on forward side of valve to intermediate case.

(m)Remove four bolts (15) and (17) securing lower bracket (9) to heat exchanger and to bracket (11) on intermediate case. Remove bracket (9).

CAUTION : DO NO HANDLE HEAT EXCHANGER VALVE AND HEAT EXCHANGER BY INLET COLLARS. INLET COLLARS ARE NOT INTEGRAL PARTS OF THE VALVE HOUSING.

(n)Remove two bolts (26) securing upper bracket (25) to bracket (5) on intermediate case.

(p)Move heat exchanger and valve outward to disengage inlet collar from inboard bolts. Allow heat exchanger and valve to drop slightly to access bolts (27). Remove two bolts (27) and bracket (25) from top of heat exchanger and valve. (Ref. Fig. 401)

(q)Rotate heat exchanger and valve (top outward) to remove from intermediate case opening while guiding cable and conduit out with heat exchanger and valve.

(r)If necessary, remove the air/oil cooler valve hydraulic tube assembly (CP08) (37) and air/oil cooler valve return tube assembly (CR08) (30) and air/oil valve hydraulic tube (CR09) (36) as follows.

1 Remove the clamp (31) and bolt (32) which attaches the tube (CR09) to the heat exchanger (22).

2 Remove the cap (35) from the tube (CR09).

3 (Pre SB PW4ENG 79-50) While you hold the wrench flats, remove the lockwire and the nuts (33), from the tubes (CR09), (CR08), and (CP08) at the bulkhead of the heat exchanger.

4 (Post SB PW4ENG 79-50) Remove the bolts (34) from the tubes (CR09), (CR08), and (CP08) from the heat exchanger.

5 While you hold the wrench flats, remove the lockwire and disconnect the (CP09), (CR08), and (CP08) tube nuts from the adapters on the heat exchanger.

(s)Install protective closures to remaining openings. Install a PWA87506 protective cover over exchanger fins.

(3)Installation (Ref. Fig. 401)

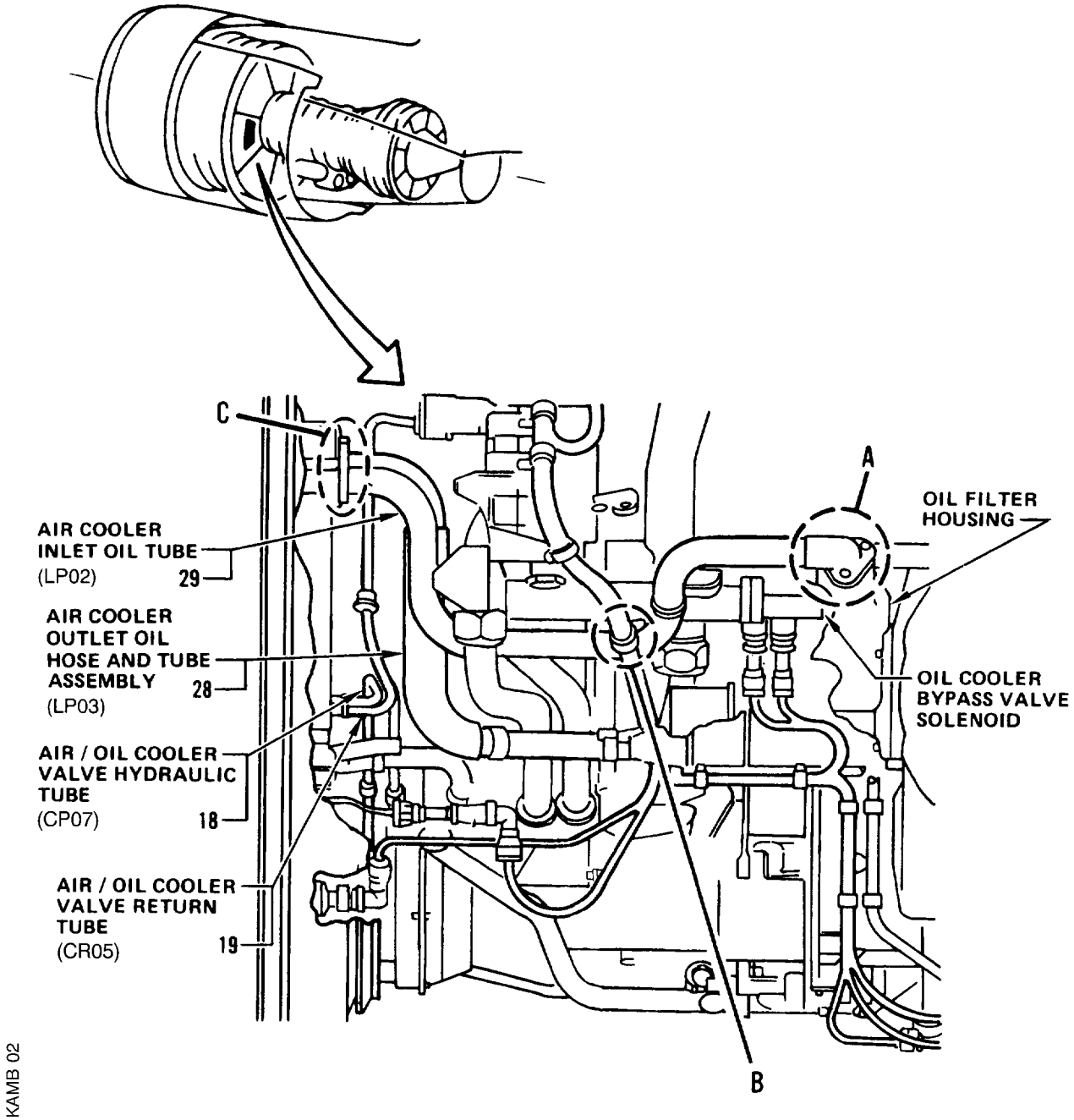
(a)If necessary, attach the air/oil cooler valve hydraulic tube assembly (CP08) (37) and air/oil cooler valve return tube assembly (CR08) (30) and air/oil valve hydraulic tube (CR09) (36) as follows.

1 Remove protective closures.

R 2 Lubricate the threads of the adapters with Antiseize Compound
R (Material No.P06-054) and attach the tubes (CP08), (CR08), and (CR09) to the air/oil heat exchanger valve adapters hand tight only.

3 (Pre SB PW4ENG 79-50) Lubricate nuts (33) with Engine Oil (Material No.P03-001). Connect the tubes (CP08), (CR08), and (CR09) to the heat exchanger and TORQUE the nuts to between 70 and 80 lbf.in. (0.79 and 0.90 m.daN).

4 (Post SB PW4ENG 79-50) Lubricate the bolts (34) and (32) with Engine


C
A
B
AIR COOLER INLET OIL TUBE (LP02) 29
AIR COOLER OUTLET OIL HOSE AND TUBE ASSEMBLY 28 (LP03)
AIR / OIL COOLER VALVE HYDRAULIC TUBE (CP07) 18
AIR / OIL COOLER VALVE RETURN TUBE (CR05) 19
OIL FILTER HOUSING
OIL COOLER BYPASS VALVE SOLENOID

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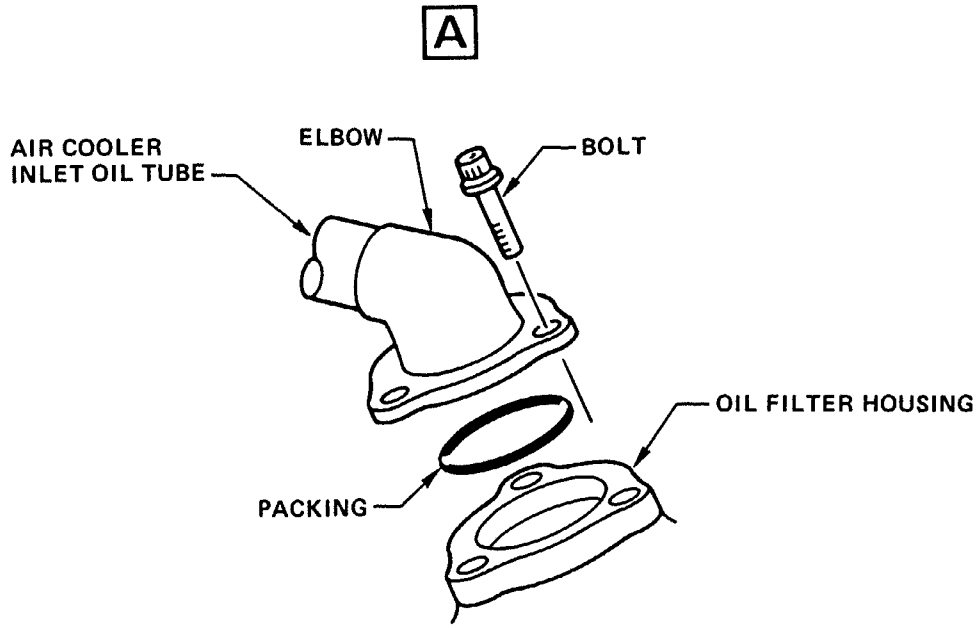
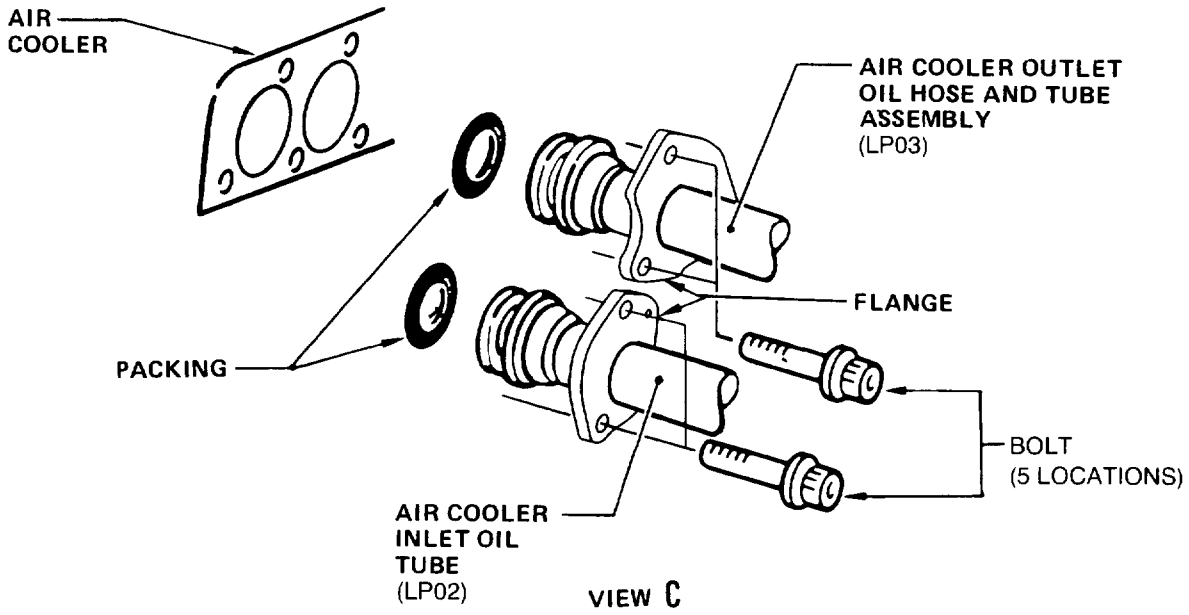
Air/Oil Heat Exchanger and Valve (Sheet 1/5)
Figure 401



Air/Oil Heat Exchanger and Valve (Sheet 2/5)
Figure 401



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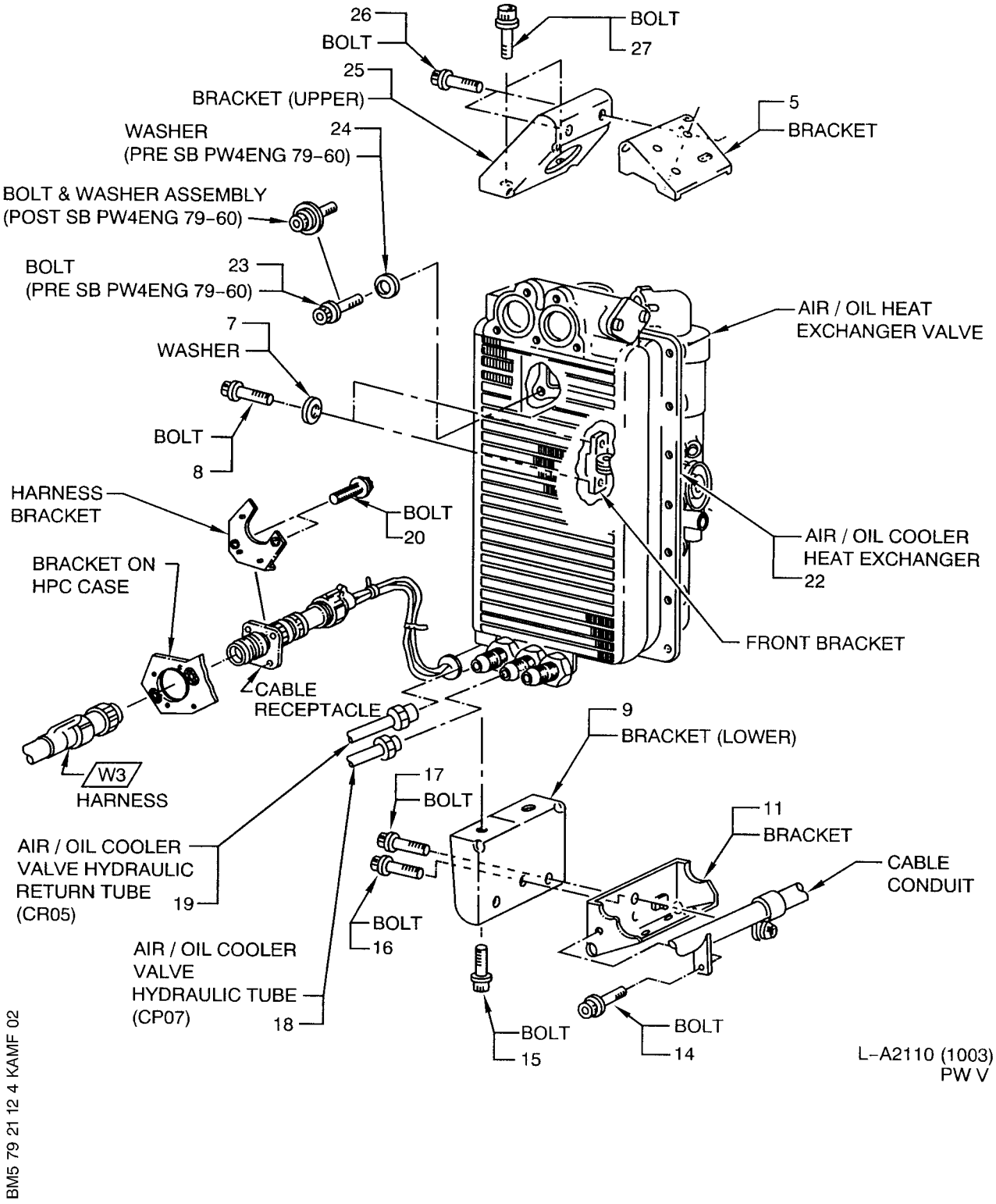
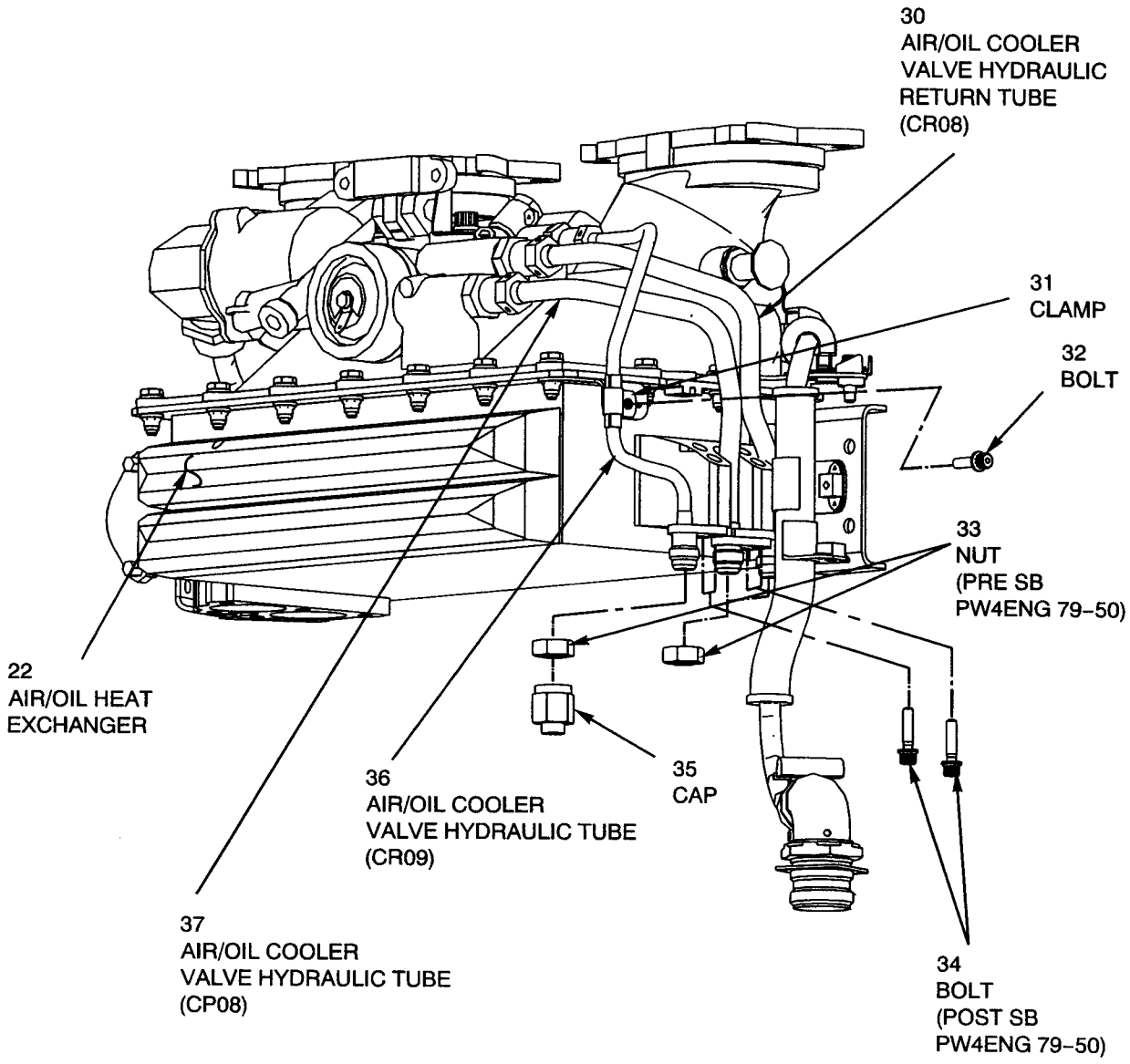
Air/Oil Heat Exchanger and Valve (Sheet 3/5)
Figure 401



Air/Oil Heat Exchanger and Valve (Sheet 4/5)
Figure 401



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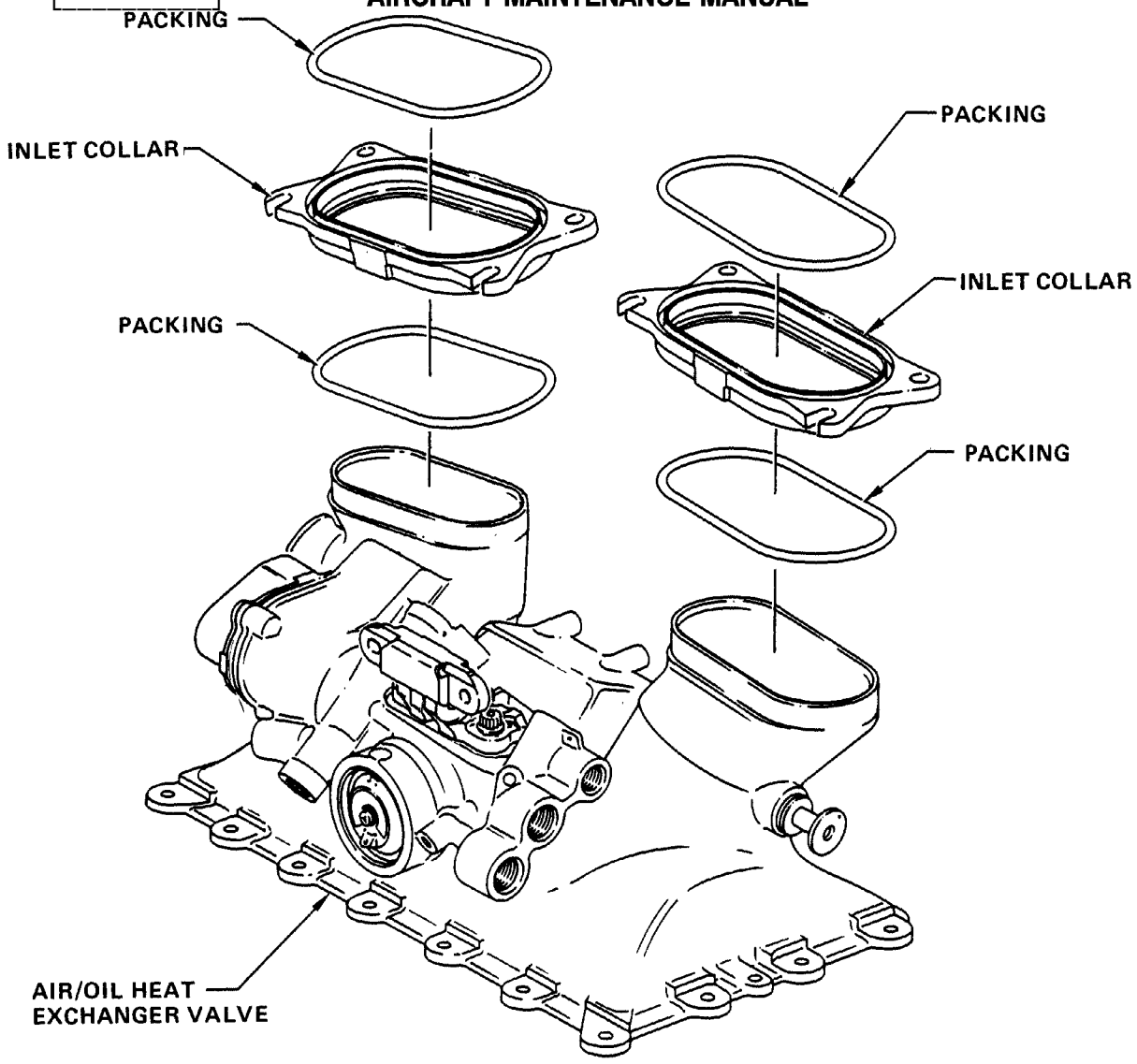
Air/Oil Heat Exchanger and Valve (Sheet 5/5)
Figure 401



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(SHOWN WITH AIR/OIL HEAT EXCHANGER REMOVED)

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Air/Oil Heat Exchanger Valve
Figure 402

Oil (Material No.P03-001) and connect the tubes (CP08), (CR08), and (CR09) to heat exchanger. TORQUE the bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

R 5 Install the cap (35), threads lubricated with Antiseize Compound
R (Material No.P06-054) to the tube (CR09) and TORQUE the cap to between 90 and 100 lbf.in. (1.02 and 1.12 m.daN).

6 TORQUE the tube nut (CP09) at the air/oil heat exchanger adapter to between 90 and 100 lbf.in. (1.02 and 1.12 m.daN).

7 TORQUE the tube nuts (CP08) and (CR08) at the air/oil heat exchanger adapters to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).

8 Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nuts.

(b)(Pre SB PW4ENG 79-60), Make sure the four inboard bolts (23) and washers (24) are installed loosely to the rear of the intermediate case as follows.

1 Make sure the four bolts (23), threads lubricated with Engine Oil (Material No.P03-001), and washers (24) are installed loosely in the four inboard bolt holes. Make sure the washers are sealed to the boltheads with Beeswax (Material No.P06-015).

(c)(Post SB PW4ENG 79-60), Make sure the four inboard bolt and washers assemblies are loosely installed in the rear of the intermediate case.

(d)Set the height of the bolts with a PWA87505 positioner.

CAUTION : DO NOT HANDLE HEAT EXCHANGER VALVE AND HEAT EXCHANGER BY INLET COLLARS. INLET COLLARS ARE NOT INTEGRAL PARTS OF THE VALVE HOUSING.

(e)Remove protective closures.

(f)Ensure detail packings are installed to inlet collars. If packings are not installed, install new packings, lubricated with Petrolatum White (Material No.P06-002) to inlet collars (Ref. Fig. 402).

(g)Install air/oil heat exchanger (22) and valve (bottom end in first) to intermediate case. Rotate top of heat exchanger and valve inward and allow to drop slightly. (Ref. Fig. 401).

CAUTION : BE CERTAIN TO USE SHORTER BOLTS (SAME AS REMOVED) TO SECURE BRACKETS (UPPER AND LOWER) TO AIR/OIL HEAT EXCHANGER AND VALVE OR DAMAGE TO UNIT MAY RESULT.

(h)Secure (upper) bracket (25) to heat exchanger and valve with two bolts (27), threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolts (27) to between 85 and 95 lbf.in. (0.96 and 1.07 mdaN). (Ref. Fig. 401).

(j)Raise heat exchanger and valve to engage inlet collars to previously installed inboard bolts and bolt assemblies on the rear of intermediate case (Ref. Fig. 401).

(k)Secure upper bracket (25) on heat exchanger to bracket (5) on intermediate case with two bolts (26), threads lubricated with Engine Oil (Material No.P03-001). Tighten bolts handtight.

(l)Install previously removed lower bracket (9) to heat exchanger. Secure bracket with two bolts (15), threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(m)Secure lower bracket (9) to bracket (11) on intermediate case with two bolts (17), threads lubricated with Engine Oil (Material No.P03-001). Tighten bolts handtight.

(n)Secure bracket on forward side of valve to intermediate case with two bolts (8), lubricated with Engine Oil (Material No.P03-001), and washers (7). Tighten bolts handtight.

(p)(Pre SB PW4ENG 79-60), Attach the valve inlet collars to the rear of the intermediate case as follows.

1 Install four outboard bolts (23), threads lubricated with Engine Oil (Material No.P03-001), and washers (24) in the outboard holes. Tighten by hand the four inboard bolts that were installed before and the four outboard bolts.

(q)(Post SB PW4ENG 79-60), Attach the valve inlet collars to the rear of the intermediate case as follows.

1 Install four bolt and washer assemblies, threads lubricated with Engine Oil (Material No.P03-001), in the outboard bolts holes. Tighten by hand the four inboard bolt and washer assemblies that were installed before and four outboard bolt and washer assemblies.

CAUTION : WITH THE PWA85853 TORQUE ADAPTER, ADJUST THE ACTUAL TORQUE WRENCH READING (REF. 70-00-00, P. BLOCK 201). TOO MUCH TORQUE CAN DAMAGE THE THREADED PARTS.

(r)TORQUE previously installed bolts (23), (17) (26) and (8) to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

NOTE : Use PWA85853 Torque Adapter to torque the four inboard bolts (23).

(s)Secure rear end of cable conduit to lower bracket (11) on intermediate case with bolts (14) and (16) threads lubricated with Engine Oil (Material No.P03-001).

(t)TORQUE bolts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

(u)Install air cooler outlet oil hose and tube assembly (LP03) (28).

1 Remove protective closures.

2 Install new packing, lubricated with Engine Oil (Material No.P03-001), in groove at flanged end.

3 Secure flange with bolts, threads lubricated with Engine Oil (Material No.P03-001) handtight only.

(v)Install air cooler inlet oil tube (LP02) (29).

1 Remove protective closures.

2 Install new packing, lubricated with Engine Oil (Material No.P03-001),in groove adjacent to flange.

3 Install new packing, lubricated with Engine Oil (Material No.P03-001), on elbow end of tube.

4 Install tube, flange end, to air cooler. Secure flange with bolts, threads lubricated with Engine Oil (Material No.P03-001).

5 Secure elbow end of tube to oil filter housing with three bolts, threads lubricated with Engine Oil (Material No.P03-001).

6 TORQUE bolts at each end of tube to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN) including outlet tube flange bolts.

(w)Install bolt, threads lubricated with Engine Oil (Material No.P03-001), and nut securing W3/W5 harness clamp to bracket installed on tube. TORQUE bolt to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

(x)Install air/oil cooler valve hydraulic return tube (CR05) (19).

R 1 Lubricate tube nut threads with Antiseize Compound
R (Material No.P06-054). Connect tube to heat exchanger (22) adapter and the manifold (CR04) tee.
2 TORQUE both tube nuts to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).
NOTE : Hold bulkhead adapter with wrench while tightening tube nut at heat exchanger.
NOTE : Hold the (CR04) tee with a wrench while tightening the tube nut.
3 Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nut.

(y)Install air/oil cooler valve hydraulic tube (CP07) (18).
R 1 Lubricate tube nut threads with Antiseize Compound
R (Material No.P06-054). Connect tube to heat exchanger (22) adapter.
2 Install the clamp and clamp bolt, threads lubricated with Engine Oil (Material No.P03-001) securing the tube to the Flange E bracket. TORQUE the clamp bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
3 TORQUE tube nut at the heat exchanger to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).
NOTE : Hold bulkhead adapter with wrench while tightening tube nut at heat exchanger.
4 While you hold the tee with a wrench, TORQUE the tube nut at the manifold (CP02) tee to between 225 and 250 lbf.in. (2.55 and 2.82 m.daN).
5 Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nuts.

(z)Remove protective closure and install valve cable flanged receptacle to HPC case bracket. Secure with harness bracket and two bolts (20), threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolts (20) to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN) (Ref. Fig. 401).

(aa)Connect W3P17 harness connector to heat exchanger and valve receptacle.
CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION. (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS

(4)Close-up
(a)Install the fan exit liner segment (inner rear) that you removed (Ref. 72-23-05, P. Block 401).
(b)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(c)On the appropriate FIRE control module, push the fire handle and remove the warning notice.
(d)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(e)Remove safety clips and tags and close circuit breakers : 19KS, 21KS, 18KS, 20KS.
(f)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

2. Valve from Air/Oil Heat Exchanger

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)Material No.P03-001	Oils (Ref. 70-00-00)
(3)Material No.P06-002	Lubricants (Ref. 70-00-00)
R (4)Material No.P06-054	Lubricants (Ref. 70-00-00)
(5)	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
(6)	Packings
(7)	Torque Wrench
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

B. Procedure

(1)Job set-up

(a)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL A	19KS	332/U70
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL A	18KS	332/U71
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL B	20KS	331/V69

(b)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(c)Remove air/oil heat exchanger and valve (Ref. Para. 1.).

(2)Removal (Ref. Fig. 403, 404, 405)

CAUTION : DO NOT HANDLE THE HEAT EXCHANGER VALVE AND/OR HEAT EXCHANGER BY THE INLET COLLARS. THE INLET COLLARS ARE NOT INTEGRAL PARTS OF THE VALVE HOUSING.

(a)Place air/oil heat exchanger and valve on the bench.

(b)(Pre SB PW4ENG 79-49) Remove lockwire and jamnuts (13) which secure the three tubes (8), (9), (10) to the flange on the heat exchanger.

(c)(Post SB PW4ENG 79-49), (Pre SB PW4ENG 79-50) Remove lockwire, jamnuts, washers and plate which secure the three tubes to the flange on the exchanger.

(d)(Post SB PW4ENG 79-50) Remove the lockwire and bolts which secure the three tubes to the exchanger.

(e)Remove the bolts (1), nuts (15), washers (2) and if equipped bracket from the valve and heat exchanger mating flange. (Ref. Fig. 403)

(f)Separate the valve (3) from the heat exchanger (14).

(g)If a new valve is to be installed, comply with the following :

1 Disconnect and remove the three tubes (8), (9), (10) from the

adapters (6), (7) on end of the valve.

2 Remove bolt, nut, and clamps securing (CR08) tube (10) to the (CP08) tube (8).

3 Remove the three adapters (6) and (7) from the valve ports and discard the packings (4) and (5). Install protective closures.

(h)If a new heat exchanger is to be installed, comply with the following :

1 Remove the bolts (11) and (17) which secure the lower (12) and upper (16) mount brackets to the heat exchanger. Remove the brackets.

(3)Installation (Ref. Fig. 403, 404, 405)

CAUTION : DO NOT HANDLE THE HEAT EXCHANGER VALVE AND/OR HEAT EXCHANGER BY THE INLET COLLARS. THE INLET COLLARS ARE NOT INTEGRAL PARTS OF THE VALVE HOUSING.

(a)Place air/oil heat exchanger valve (3) on bench with the two four hole ducts downward and three end ports facing operator.

(b)Place air/oil heat exchanger (14) on valve with three hole tube flange toward operator.

(c)Secure heat exchanger to valve with bolts (1), threads lubricated with Material No.P03-001, washers (2) except at bracket (18) if equipped (under bolt heads and nuts) and nuts (15). TORQUE nuts to between 36 and 40 lbf. in. (0.40 and 0.45 m.daN).

(d)(Post SB PW4 ENG 79-44). Install a clamp on wiring harness and secure to bracket (18) with bolt, threads lubricated with Material No. P03-001.
TORQUE the clamp bolt to between 36 and 40 lbf. in. (0.41 and 0.45 m.daN).

(e)If new valve was installed, comply with the following :

1 Install packing (4), lubricated with Material No.P06-002, on smaller adapter (6). Lubricate adapter threads with Material No.P03-001, and install adapter in smaller port in valve. TORQUE adapter to between 65 and 75 lbf.in. (0.73 and 0.84 m.daN).

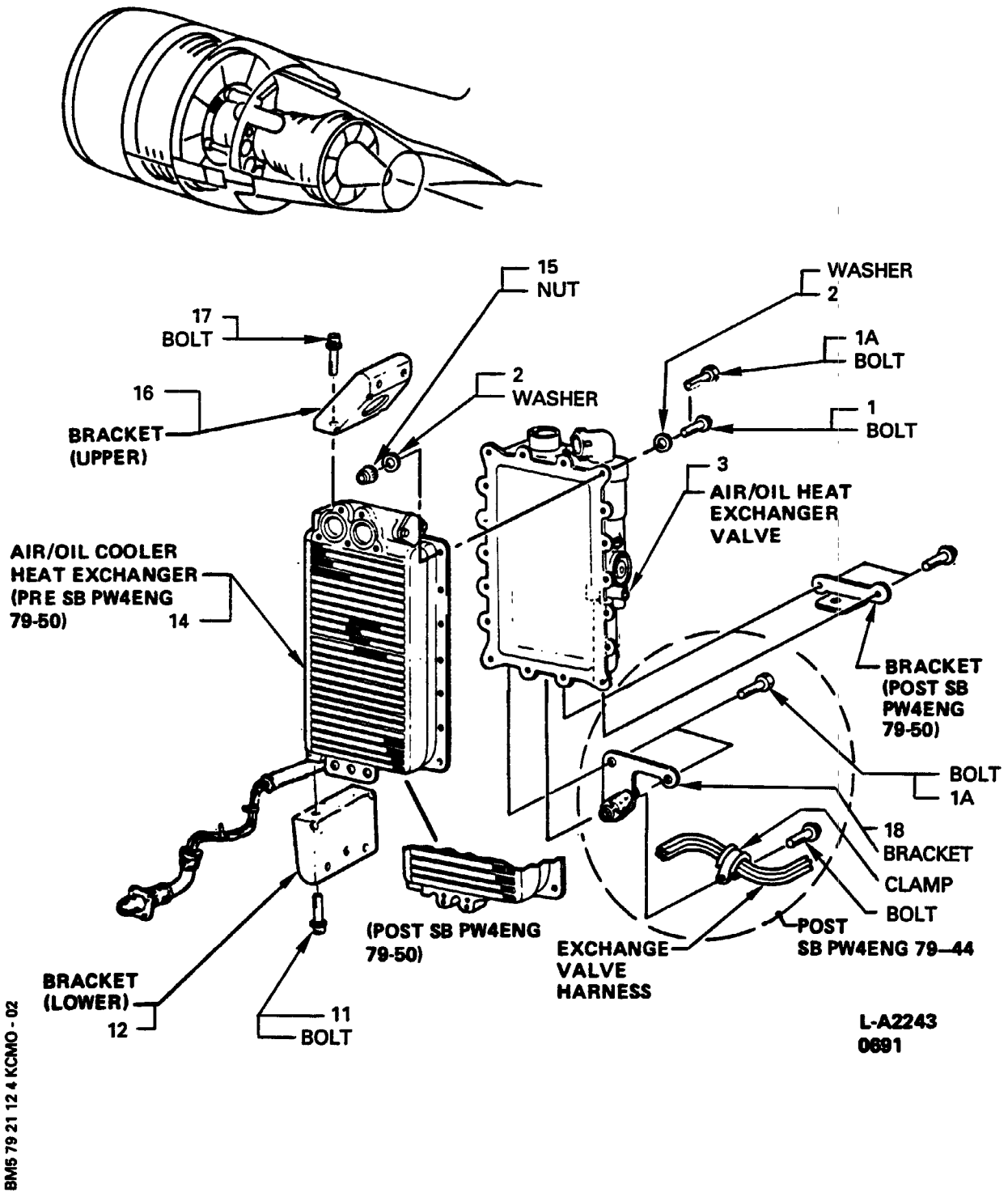
2 Install packings (5), lubricated with Material No.P06-002, on two larger adapters (7). Lubricate adapter threads with Material No.P03-001, and install adapters in two remaining ports. TORQUE adapters to between 110 and 120 lbf.in. (1.24 and 1.35 m.daN).

3 Install the air shut off valve drain tube (CR09) as follows.

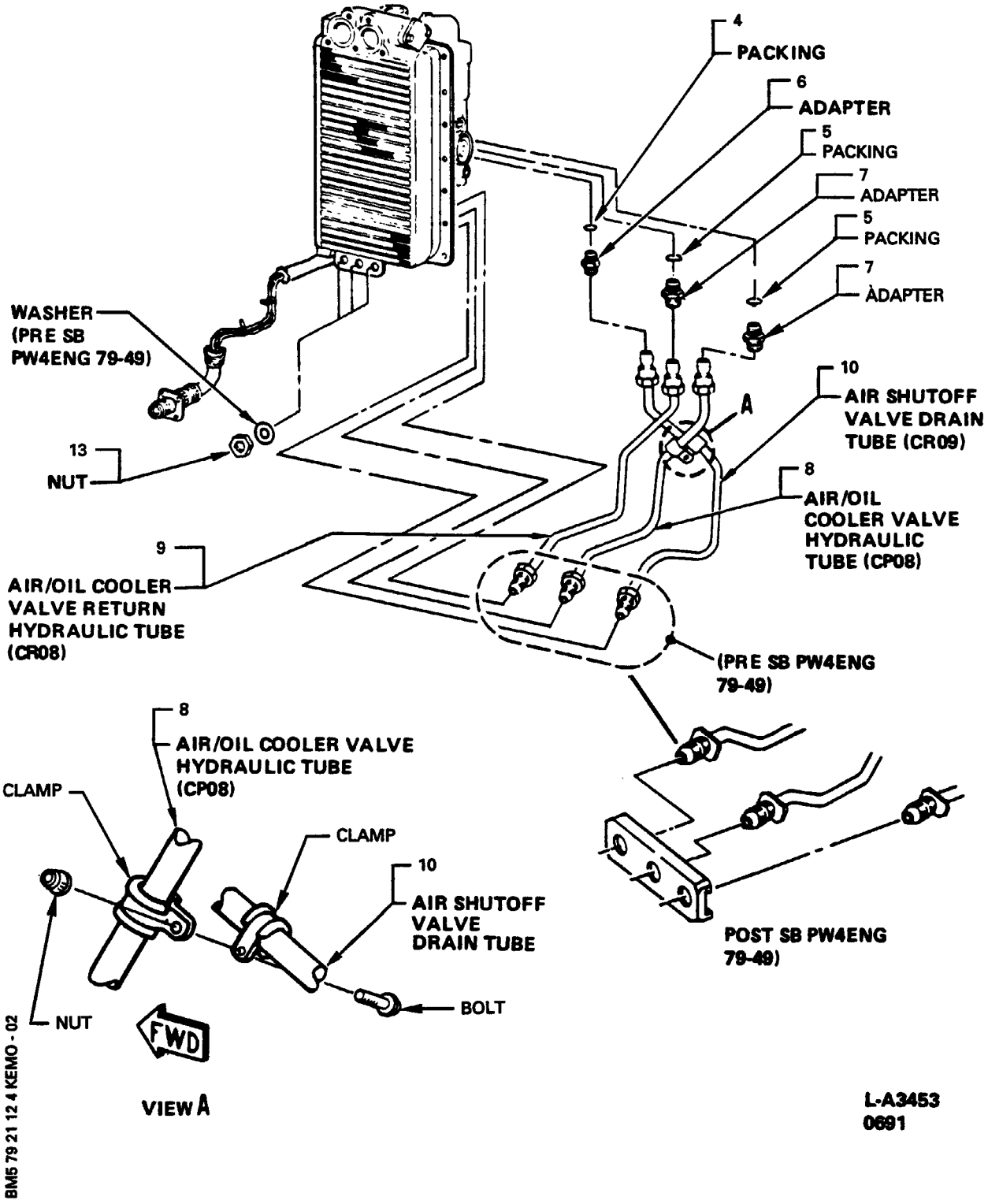
- (Pre SB PW4ENG 79-49) Lubricate the threads of the smaller adapter
R with Material No.P06-054, and attach the tube to the adapter and to the hole in flange on the heat exchanger. Secure the coupling on the tube to the heat exchanger with a jamnut, threads lubricated with Material No.P03-001. TORQUE the jamnut to between 70 and 80 lbf.in. (0.79 and 0.90 m.daN).

- (Post SB PW4ENG 79-49), (Pre SB PW4ENG 79-50) Lubricate the
R threads of the smaller adapter with Material No.P06-054, and attach the tube to the adapter and to the hole in the tube flange on the heat exchanger with a plate between flats on the tube and the flange.
Lubricate the threads on the coupling end of the tube with Material No.P03-001 and secure it with a washer and a jamnut. TORQUE the jamnut to between 70 and 80 lbf.in. (0.79 and 0.90 m.daN).

- (Post SB PW4ENG 79-50) Lubricate the threads of the smaller adapter
R with Material No.P06-054, and attach the tube to the adapter and to



Air/Oil Heat Exchanger and Valve (Sheet 1/2)
Figure 403



Air/Oil Heat Exchanger and Valve (Sheet 2/2)
Figure 404

the exchanger with two bolts, threads lubricated with Material No.P03-001. TORQUE the bolts to between 32 and 36 lbf.in. (0.36 and 0.40 m.daN).
- TORQUE tube nut to between 90 and 100 lbf.in. (1.01 and 1.12 m.daN). Wirelock the tube nut and if equipped bolts or a jamnut.

4 Install the air/oil cooler valve return tube (CR08 and the air/oil cooler valve hydraulic tube (CP08) as follows.
- (Pre SB PW4ENG 79-49) Lubricate the threads on the remaining adapters with Material No.P06-054. Attach the tubes to the remaining adapters, with the couplings on the tubes through the tube flange on the heat exchanger.
Lubricate the threads on the couplings with Material No.P03-001 and secure them with the jamnuts. TORQUE the jamnuts to between 70 and 80 lbf.in. (0.79 and 0.90 m.daN).).
- (Post SB PW4ENG 79-49), (Pre SB PW4ENG 79-50) Lubricate the threads on the remaining adapters with Material No.P06-054. Attach the tubes to the remaining adapters, with the couplings on the tubes through the plate and the flange on the heat exchanger. Lubricate the threads on the couplings with Material No.P03-001 and secure them on the tubes with washers and the jamnuts. TORQUE the jamnuts to between 70 and 80 lbf.in. (0.79 and 0.90 m.daN).
- (Post SB PW4ENG 79-50) Lubricate the threads on the remaining adapters with Material No.P06-054. Attach the tubes to the remaining adapters and to the exchanger with bolts, threads lubricated with Material No.P03-001. TORQUE the bolts to between 32 and 36 lbf.in. (0.36 and 0.40 m.daN).
- TORQUE the tube nuts to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Wirelock the tube nuts and if equipped bolts or jamnuts.

5 Install clamps, bolt(s), threads lubricated with Material No.P03-001, and nut which secure the tubes. TORQUE bolt to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

(f)If new heat exchanger is to be installed, comply with the following :

1 Install upper mount bracket (16) and lower mount bracket (12) on heat exchanger. Secure brackets with bolts (17) and (11), threads lubricated with Material No.P03-001. TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(4)Close-up and test

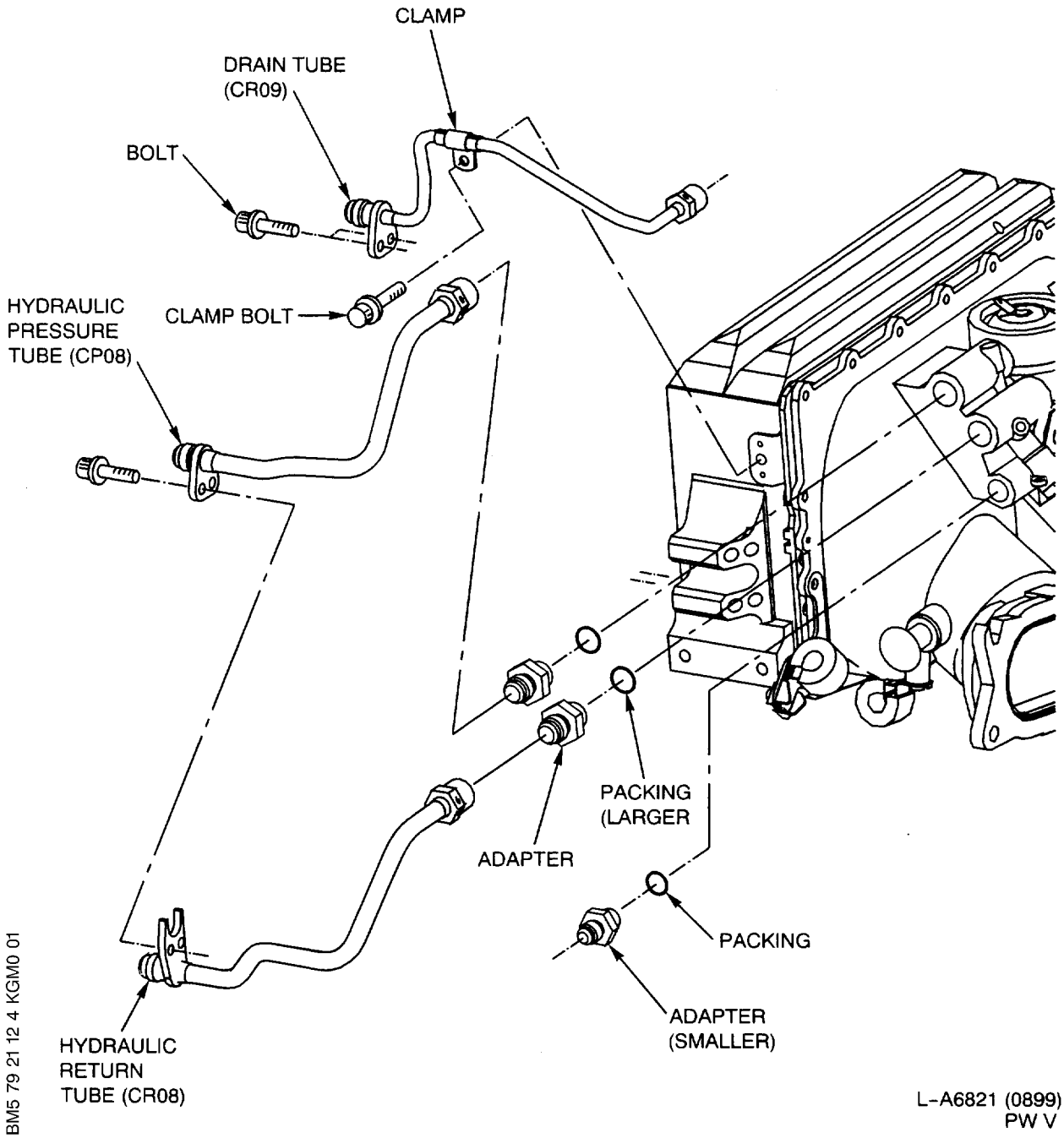
(a)Install air/oil heat exchanger on valve (Ref. Para. 1.(3)).

(b)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(c)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(d)Remove safety clips and tags and close circuit breakers : 18KS, 20KS, 19KS, 21KS.

(e)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501) and check that AOHE % indication shows about 100 % on right ECAM display unit.



Air/Oil Heat Exchanger and Valve (Sheet 3/3)
Figure 405

HOUSING ASSEMBLY-MAIN BEARING STRAINER - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breakers Safety Clips
B.	Ferrule
C.	Gasket
D.	Packings
E.	Retainers
F.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
G.	Container Min. Capacity of 5 U.S. Gal. (19 l)
H. Material No.P03-001	Oils (Ref. 70-00-00)
I. Material No.P05-289	Special Materials (Ref. 70-00-00)
J. Material No.P05-291	Special Materials (Ref. 70-00-00)
K. Material No.P05-292	Special Materials (Ref. 70-00-00)
R L. Material No.P06-054	Lubricants (Ref. 70-00-00)
M. Material No.P06-021	Lubricants (Ref. 70-00-00)
N. Material No.P06-036	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure

NOTE : This procedure is available on aircraft equipped with PHASE I configured engines.

A. Job Set-Up

(1)On the FIRE control module (overhead panel) of the engine concerned pull the fire handle and install a warning notice to prohibit actuation in normal position (pushed) while maintenance is in progress.

(2)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES-ENG1 FADEC SOLENOIDS CH.A	19KS	332/U70
133VU	ENGINES-ENG1 FADEC SOLENOIDS CH.B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES-ENG2 FADEC SOLENOIDS CH.A	18KS	332/U71
133VU	ENGINES-ENG2 FADEC SOLENOIDS CH.B	20KS	331/V69

(3)Open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

A. Job Set-Up

(1)On the FIRE control module (overhead panel) of the engine concerned pull the fire handle and install a warning notice to prohibit actuation in normal position (pushed) while maintenance is in progress.

(2)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
123VU	ENGINES-ENG1 FADEC SOLENOIDS CH.A	19KS	302/D54
123VU	ENGINES-ENG1 FADEC SOLENOIDS CH.B	21KS	302/D65
FOR ENGINE 2			
123VU	ENGINES-ENG2 FADEC SOLENOIDS CH.A	18KS	302/D55
123VU	ENGINES-ENG2 FADEC SOLENOIDS CH.B	20KS	302/D64

(3)Open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

**ON A/C 101-200,

B. Removal (Ref. Fig. 401)

(1)Remove the main bearing strainer housing

NOTE : Be prepared to catch fuel and oil in a container with a minimum capacity of 5 U.S. gallons (19 liters).

CAUTION : YOU MUST USE THE WRENCHING FLATS ON THE MATING PARTS WHEN YOU LOOSEN OR TIGHTEN ALL TUBE NUTS. THIS WILL PREVENT TWIST DAMAGE TO THE TUBES.

(a)(Post SB PW4ENG 79-52) Remove the bolt, nut and clamp that attach the tube (LP32) to a bracket on the flange of the secondary flow control valve.
(End of SB PW4ENG 79-52)

(b)Remove the lockwire or safety cable. Use the wrenching flats to disconnect the tube nuts from the oil tube metering nipple.
Loosen the clamp bolts that attach the oil trim pressure tube (LP32).
Loosen the three bolts that attach the oil trim pressure tube (LP32) to the main oil filter housing. Remove the metering nipple.

(c)(Pre SB PW4ENG 79-52) Remove the lockwire or safety cable and disconnect the No. 3 bearing oil pressure manifold (LP18) from the rear of the main bearing strainer housing.
Remove the hose clamp, spray shield and lockwire or safety cable.
Disconnect the manifold from the front of the No. 3 bearing oil strainer housing (LP19). Remove the attaching hardware and remove the tube from the engine.

(d)(Post SB PW4ENG 79-52) Remove the lockwire or safety cable and disconnect the No. 3 bearing oil pressure manifold (LP18) from the rear of the main bearing strainer housing.
Remove the bolt, clamp and spray shield from the rear of the manifold.
Disconnect the manifold from the front of the No. 3 bearing presssure tube (LP19). Remove the attaching hardware and remove the tube from the engine.

(End of SB PW4ENG 79-52)

(e)Remove lockwire or safety cable and disconnect gearbox oil pressure manifold (LP08) from inboard side of strainer housing.

(f)Loosen and remove the clamp bolt and nut from the clamp on the bracket that is attached to the No. 1, 1.5 and 2 main bearing oil pressure tube (LP05) and the main bearing breather tube (LB06) (Ref. Fig. 401) (Sheet 2) (Post SB PW4 ENG 79-33).

(g)Remove the lockwire or safety cable and disconnect No. 1, 1.5, and 2 main bearing oil pressure tube from front of strainer housing and from strainer housing attached to Flange E bracket.
Loosen clamp bolt that attaches the tube to Flange E bracket.
Disengage tube from strainer housings.

(h)Remove four bolts that attach the strainer housing to top of fuel/oil cooler.
Reposition brackets on strainer housing flange with W5 harness attached and remove strainer housing.

(i)Remove and discard packings from tubes and strainer housing flange.

(j)Install protective closures.

C. Installation (Ref. Fig. 401, 402, 403)

(1)Install main bearing strainer housing.

(a)Remove protective closures.

(b)Lubricate threads of two largest adapters (front and rear of strainer housing) with Antigalling Compound (Material No.P06-021).
Lubricate threads of smaller adapter (inboard side of housing) with
R Antiseize Compound (Material No.P06-054).

(c)Install packing, lubricated with Engine Oil (Material No.P03-001), and retainer to the No. 1, 1.5 and 2 main bearing oil pressure manifold (LP05).

(d)Install packing, lubricated with Engine Oil (Material No.P03-001), to groove in flange of main bearing strainer housing. Install housing to top of fuel/oil cooler engaging tubes to adapters.

(e)Attach housing to fuel/oil cooler with four bolts, threads lubricated with Engine Oil (Material No.P03-001), and brackets attached to W5 harness. TORQUE bolts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(f)Install the No. 1, 1.5 and 2 main bearing oil pressure tube (LP05).

1 Lubricate the threads of the tube nuts with Antigalling Compound (Material No.P06-021).
Install the tube to the strainer housings (packing and retainer at the rearward end) and tighten tube nuts by hand.

2 TORQUE the clamp bolt that attaches the tube to flange E bracket to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

3 TORQUE the clamp bolt that attaches the main bearing pressure tube (LP05) to the bracket that attaches the main bearing breather tube (LB06) to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN). (Ref. Fig. 401) (Sheet 2) (Post SB PW4ENG 79-33).

4 TORQUE the forward tube nut to between 675 and 750 lbf.in. (7.63 and 8.47 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and the Safety Cable Ferrule (Material No.P05-292) to safety the forward tube nut.

5 TORQUE the rear tube nut to between 140 and 160 lbf.in. (1.59 and 1.80 m.daN). Loosen the tube nut and TORQUE the tube nut to the same torque values. Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and the Safety Cable Ferrule (Material No.P05-292) to safety the rear tube nut.

(g) Connect and TORQUE the nut on the gearbox oil pressure manifold (LP08) to between 675 and 750 lbf.in. (7.63 and 8.47 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and the Safety Cable Ferrule (Material No.P05-292) to safety the manifold nut.

(h) Install the No. 3 bearing oil pressure manifold (LP18) as follows :

CAUTION : DO THIS PROCEDURE EXACTLY AS FOLLOWS OR TUBE FAILURE CAN RESULT.
YOU MUST USE THE WRENCHING FLATS ON THE MATING PARTS WHEN YOU LOOSEN OR TIGHTEN ALL TUBE NUTS. THIS WILL PREVENT ANY TWIST DAMAGE TO THE TUBES.

1 Be sure and loosen
- (Pre SB PW4ENG 79-52), the clamp bolt that attaches the ferrule end of No. 3 bearing pressure tube (LP19) to the Flange K bracket.
- (Post SB PW4ENG 79-52), the clamp bolts that attach the ferrule end of the No. 3 bearing pressure tube (LP19) to the Flange K bracket.
- the three bolts that attach the oil trim pressure tube (LP32) to the main oil filter housing.

2 (Pre SB PW4ENG 79-52) Lubricate the back of the manifold ferrules with Antigallant Compound (Material No.P06-036) (Ref. Fig. 402). Lubricate the forward tube nut threads with Antigalling Compound (Material No.P06-021). Lubricate the rear tube nut threads with
R Antiseize Compound (Material No.P06-054). Lubricate the packing with Engine Oil (Material No.P03-001). Install the packing and retainer to the tube.

3 (Post SB PW4ENG 79-52) Lubricate the back of the manifold ferrules and the manifold nut threads with Antigalling Compound (Material No. P06-021). Lubricate the packing with Engine Oil (Material No.P03-001).
Install the packing and retainer to the manifold (Ref. Fig. 403).
(End of SB PW4ENG 79-52)

4 Install the manifold (LP18) to the strainer housings. Tighten by hand.

5 Lubricate the threads of the oil tube metering nipple (restrictor) with Antigalling Compound (Material No.P06-021). Lubricate the back of the ferrules on the oil trim pressure tubes (LP31) and (LP32) with Antigallant Compound (Material No.P06-036) (Ref. Fig. 402, 403). Install the nipple to the two oil trim pressure tubes (LP31) and (LP32). Tighten by hand.

6 Lubricate the clamp bolts with Engine Oil (Material No.P03-001) and install the attaching hardware for the No. 3 bearing oil pressure manifold (LP18) and the oil trim pressure tube (LP32).

7 (Reference 2016) (Post SB PW4ENG 72-211 only) Be sure that the center of the forward clamp (on the oil trim pressure tube) is between 2.500 and 3.000 in. (63.500 and 76.200 mm) from the center of the rear clamp.

(End of SB PW4ENG 72-211)

8 TORQUE the clamp bolts and tubes exactly as follows :
- The clamp bolt that attaches the back to back clamps (LP18) to (LP32) to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
- The clamp bolt(s) that attach the tubes to the oil cooler rear bracket to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
- (Pre SB PW4ENG 79-52) The clamp bolt that attaches the ferrule end of the No. 3 bearing oil strainer (LP19) to the Flange K bracket to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
- (Post SB PW4ENG 79-52) The bolts that attach the ferrule end of the No. 3 bearing pressure tube (LP19) to the bracket on Flange K to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
- The three bolts that attach the oil trim pressure tube (LP32) to the main oil filter housing to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).
  (End of SB PW4ENG 79-52)
- The front tube nut of the (LP18) manifold to the strainer housing to between 140 and 160 lbf.in. (1.59 and 1.80 m.daN), then loosen and TORQUE again to the same value.
- The tube nuts, (LP31) and (LP32), that attach the oil tube metering nipple (restrictor) to between 675 and 750 lbf.in. (7.63 and 8.47 m.daN).
- (Post SB PW4ENG 79-52) Install a clamp to the tube nut end of the oil trim pressure tube (LP32) and attach the clamp to a bracket on the secondary flow control valve flange with a bolt, lubricated with Engine Oil (Material No. P03-001) and a nut. TORQUE the nut to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
  (End of SB PW4ENG 79-52)
- The manifold nut (LP18) to the adapter in the No. 3 bearing oil pressure tube (LP19) at Flange K to between 675 and 750 m.daN (7.63 and 8.47 m.daN).

9 Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) at all necessary locations.

10 (Pre SB PW4ENG 79-52) Install the spray shield to the inboard side of the rear manifold (LP18) connection.
Attach the spray shield with the hose clamp and TORQUE the clamp to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).

11 (Post SB PW4ENG 79-52), Install the spray shield to the inboard side of the rear manifold (LP18) that is attached to the No. 3 bearing pressure tube (LP19). Attach the spray shield with a clamp and a bolt, threads lubricated with Engine Oil (Material No.P03-001), to a bracket attached to the flange of the cooling air tube on the high compressor.
TORQUE the bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(End of SB PW4ENG 79-52)

D. Close-Up
(1) On the appropriate FIRE control module, push the fire handle and remove the warning notice.
(2) Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(3)Remove safety clips and tags and close circuit breakers 18KS, 19KS, 20KS and 21KS.
(4)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

2. Procedure

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

NOTE : This procedure is available on aircraft equipped with PHASE III configured engines.

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

A. Job Set-Up
(1)On the FIRE control module (overhead panel) of the engine concerned, pull the fire handle and install a warning notice to prohibit actuation in normal position (pushed) while maintenance is in progress.
(2)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES-ENG1 FADEC SOLENOIDS CH.A	19KS	332/U70
133VU	ENGINES-ENG1 FADEC SOLENOIDS CH.B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES-ENG2 FADEC SOLENOIDS CH.A	18KS	332/U71
133VU	ENGINES-ENG2 FADEC SOLENOIDS CH.B	20KS	331/V69

(3)Open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

B. Removal (Ref. Fig. 401)

(1)Remove the main bearing strainer housing

NOTE : Be prepared to catch fuel and oil in a container with a minimum capacity of 5 U.S. gallons (19 liters).

CAUTION : YOU MUST USE THE WRENCHING FLATS ON THE MATING PARTS WHEN YOU LOOSEN OR TIGHTEN ALL TUBE NUTS. THIS WILL PREVENT TWIST DAMAGE TO THE TUBES.

(a)Remove the bolt, nut and clamp that attach the tube (LP32) to a bracket on HPC cover.

(b)Remove the lockwire or safety cable. Use the wrenching flats to disconnect the tube nuts from the oil tube metering nipple.
Loosen the clamp bolts that attach the oil trim pressure tube (LP32).
Loosen the three bolts that attach the oil trim pressure tube (LP32) to the main oil filter housing. Remove the metering nipple.

(c)Remove the lockwire or safety cable and disconnect the No. 3 bearing oil pressure manifold (LP18) from the rear of the main bearing strainer housing.
Remove the bolt, clamp and spray shield from the rear of the manifold. Disconnect the manifold from the front of the No. 3 bearing pressure tube (LP19). Remove the attaching hardware and remove the tube from the engine.

(d)Remove the lockwire or safety cable and disconnect the gearbox oil pressure manifold (LP08) from the inboard side of the strainer housing.

(e)Loosen and remove the clamp bolt and nut from the clamp on the bracket that is attached to the No. 1, 1.5 and 2 main bearing oil pressure tube (LP05) and the main bearing breather tube (LB06).
(Post SB PW4ENG 79-33) (Ref. Fig. 401) (Sheet 3)

(f)Remove the lockwire or safety cable and disconnect the No. 1, 1.5 and 2 main bearing oil pressure tube (LP05) from the front of the strainer housing and from the strainer housing attached to the Flange E bracket. Loosen the clamp bolt that attaches the tube to the Flange E bracket. Disengage the tube from the strainer housings.

(g)Remove the four bolts that attach the strainer housing to the top of the fuel/oil cooler. Reposition the brackets on the strainer housing flange with the W5 harness attached and remove the strainer housing.

(h)Remove and discard the packings from the tubes and the strainer housing flange.

(i)Install protective closures.

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

C. Installation (Ref. Fig. 401, 403)

(1)Install the main bearing strainer housing

(a)Remove the protective closures.

(b)Lubricate the threads of the two largest adapters (front and rear of strainer housing) with Antigalling Compound (Material No.P06-021). Lubricate the threads of the smaller adapter (inboard side of the
R housing) with Antiseize Compound (Material No.P06-054).

(c)Install the packing, lubricated with Engine Oil (Material No.P03-001) and the retainer to the No. 1, 1.5 and 2 main bearing oil pressure manifold (LP05).

(d)Install the packing, lubricated with Engine Oil (Material No.P03-001), to the groove in the flange of the main bearing strainer housing. Install the housing to the top of the fuel/oil cooler and engage the tubes to the adapters.

(e)Attach the housing to the fuel/oil cooler with four bolts, threads lubricated with Engine Oil (Material No.P03-001) and brackets attached to W5 harness. TORQUE the bolts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(f)Install the No. 1, 1.5 and 2 main bearing oil pressure tube (LP05).

1 Lubricate the threads of the tube nuts with Antigalling Compound (Material No.P06-021).
Install the tube to the strainer housings (packing and retainer at the rearward end) and tighten tube nuts by hand.

2 TORQUE the clamp bolt that attaches the tube to flange E bracket to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

3 TORQUE the clamp bolt that attaches the main bearing pressure tube (LP05) to the bracket that attaches to the main bearing breather tube (LB06) to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN). (Ref. Fig. 401) (Sheet 2) (Post SB PW4ENG 79-33)

4 TORQUE the forward tube nut to between 675 and 750 lbf.in. (7.63 and 8.47 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the forward tube nut.

5 TORQUE the rear tube nut to between 140 and 160 lbf.in. (1.59 and 1.80 m.daN). Loosen the tube nut and TORQUE the tube nut to the same torque values. Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the rear tube nut.

(g)Connect and TORQUE the gearbox oil pressure manifold (LP08) to between 675 and 750 lbf.in. (7.63 and 8.47 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the manifold nut.

(h)Install the No. 3 bearing oil pressure manifold (LP18) as follows :

CAUTION : DO THIS PROCEDURE EXACTLY AS FOLLOWS OR TUBE FAILURE CAN RESULT.
YOU MUST USE THE WRENCHING FLATS ON THE MATING PARTS WHEN YOU LOOSEN OR TIGHTEN TUBE NUTS. THIS WILL PREVENT TWIST DAMAGE TO THE TUBES.

1 Be sure and loosen
- The clamp bolts that attach the ferrule end of the No. 3 bearing pressure tube (LP19) to the Flange K bracket.
- The three bolts that attach the oil trim pressure tube (LP32) to the main oil filter housing.

2 Lubricate the back of the manifold ferrules and the manifold nut threads with Antigalling Compound (Material No.P06-021).
Lubricate the packing with Engine Oil (Material No.P03-001).
Install the packing and retainer to the manifold (Ref. Fig. 403).

3 Install the manifold (LP18) to the strainer housings. Tighten by hand.

4 Lubricate the threads of the oil tube metering nipple (restrictor) with Antigalling Compound (Material No.P06-021). Lubricate the back of the ferrules on the oil trim pressure tubes (LP31) and (LP32) with Antigallant Compound (Material No.P06-036) (Ref. Fig. 403). Install the nipple to the two oil trim pressure tubes (LP31) and (LP32). Tighten by hand.

5 Lubricate the clamp bolts with Engine Oil (Material No.P03-001) and install the attaching hardware for the No. 3 bearing oil pressure manifold (LP18) and the oil trim pressure tube (LP32).

6 (Reference 2016) Be sure that the center of the forward clamp (on the oil trim pressure tube) is between 2.500 and 3.000 in. (63.500 and 76.200 mm) from the center of the rear clamp.

7 TORQUE the clamp bolts and tubes exactly as follows :

- The clamp bolt that attaches the back to back clamps (LP18) to (LP32) to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
- The clamp bolt(s) that attach the tubes to the oil cooler rear bracket to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
- The bolts that attach the ferrule end of the No. 3 bearing pressure tube (LP19) to the bracket on Flange K to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
- The three bolts that attach the oil trim pressure tube (LP32) to the main oil filter housing to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).
- The front tube nut of the (LP18) manifold to the strainer housing to between 140 and 160 lbf.in. (1.59 and 1.80 m.daN), then loosen and TORQUE again to the same value.
- The tube nuts, (LP31) and (LP32), that attach the oil tube metering nipple (restrictor) to between 675 and 750 lbf.in. (7.63 and 8.47 m.daN).
- Install a clamp to the tube nut end of the oil trim pressure tube (LP32) and attach the clamp to a bracket on the HPC cover with a bolt, lubricated with Engine Oil (Material No.P03-001) and a nut. TORQUE the nut to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
- The manifold nut (LP18) to the adapter in the No.3 bearing oil pressure tube (LP19) at flange K to between 675 and 750 lbf.in. (7.63 and 8.47 m.daN).

8 Install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) at all necessary locations.

9 Install the spray shield to the inboard side of the rear manifold (LP18) that is attached to the No.3 bearing pressure tube (LP19). Attach the spray shield with a clamp and a bolt, threads lubricated with Engine Oil (Material No.P03-001), to a bracket attached to the flange of the cooling air tube on the high compressor. TORQUE the bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

D. Close-Up

(1) On the appropriate FIRE control module, push the fire handle and remove the warning notice.
(2) Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(3) Remove safety clips and tags and close circuit breakers 18KS, 19KS, 20KS

and 21KS.

(4)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

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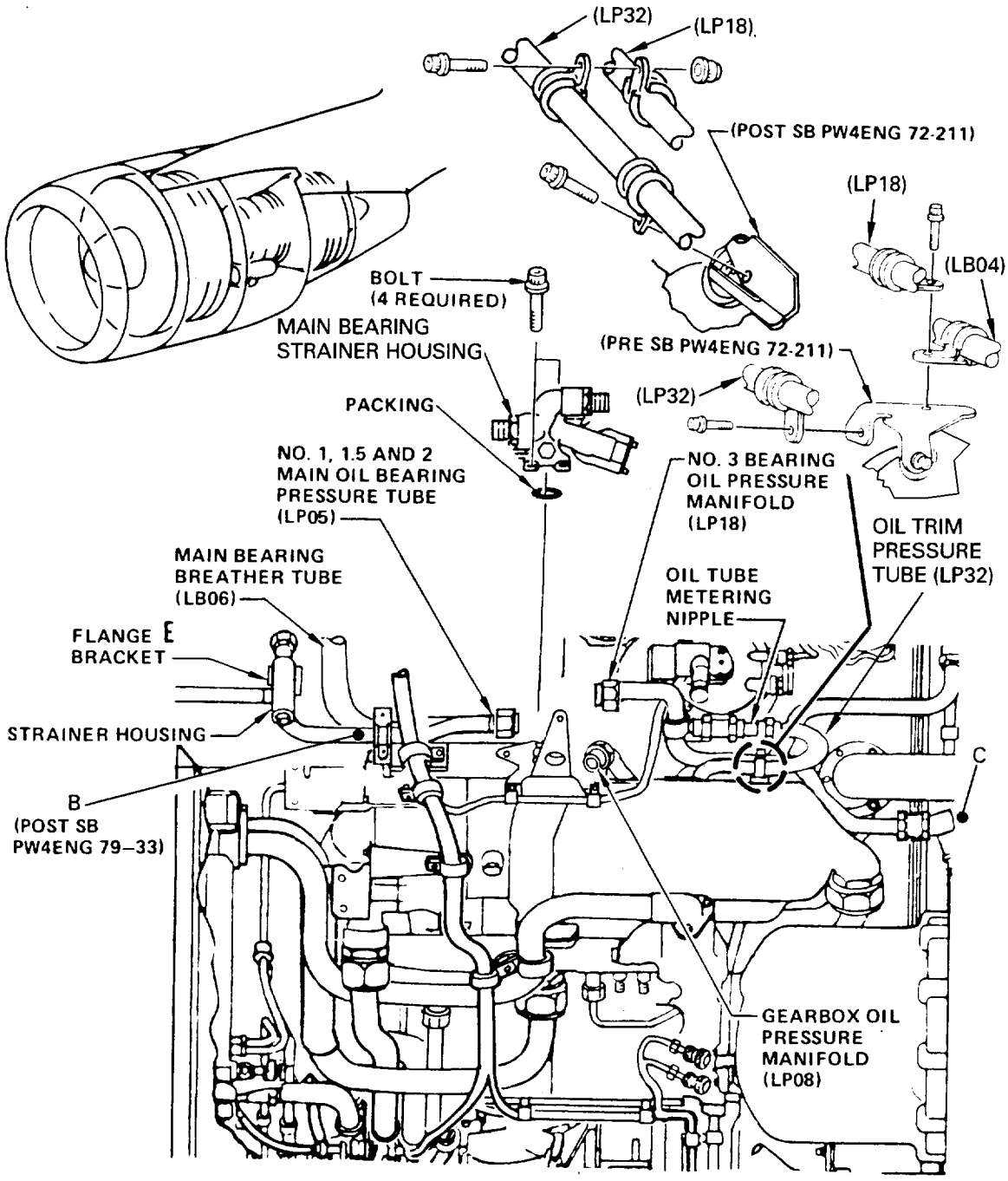
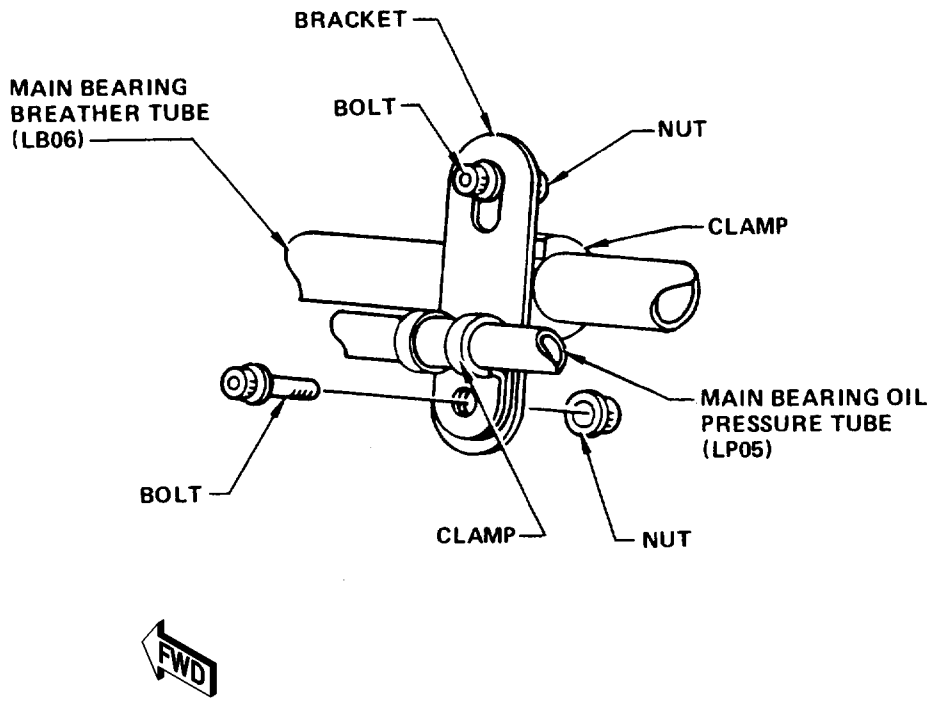


BM5 79 21 41 4 KAMA 00

Fuel/Oil Cooler Mounted Main Bearing Strainer Housing
(Sheet 1)
Figure 401



VIEW B

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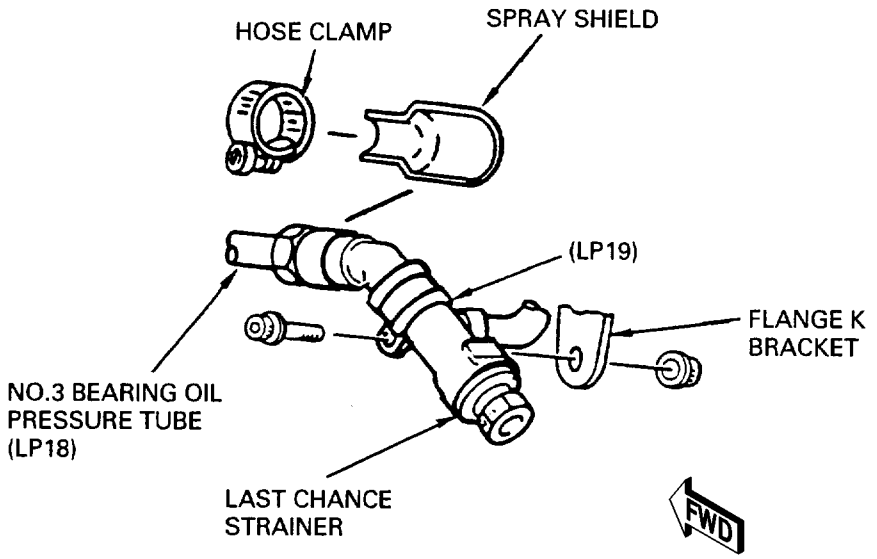
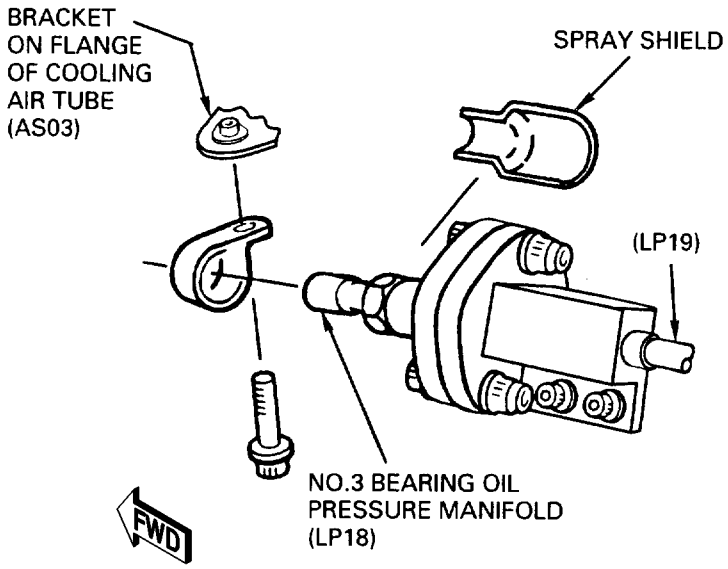
BM5 79 21 41 4 KAMC 00

Fuel/Oil Cooler Mounted Main Bearing Strainer Housing
(Post SB PW4ENG 79-33) (Sheet 2)
Figure 401



VIEW C
(PRE SB PW4ENG 79-52)

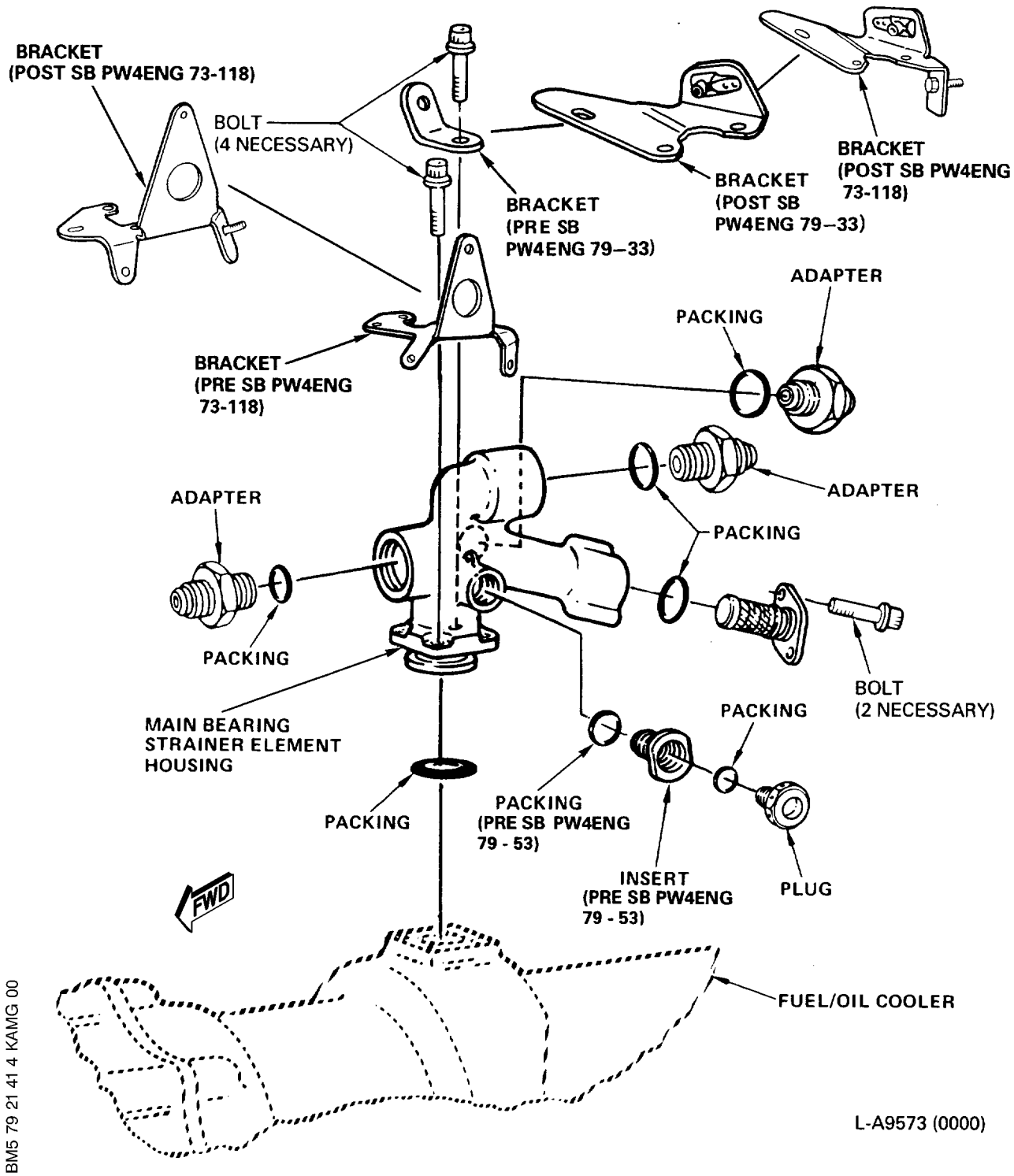


VIEW C
(POST SB PW4ENG 79-52)

L-A8056 (0000)

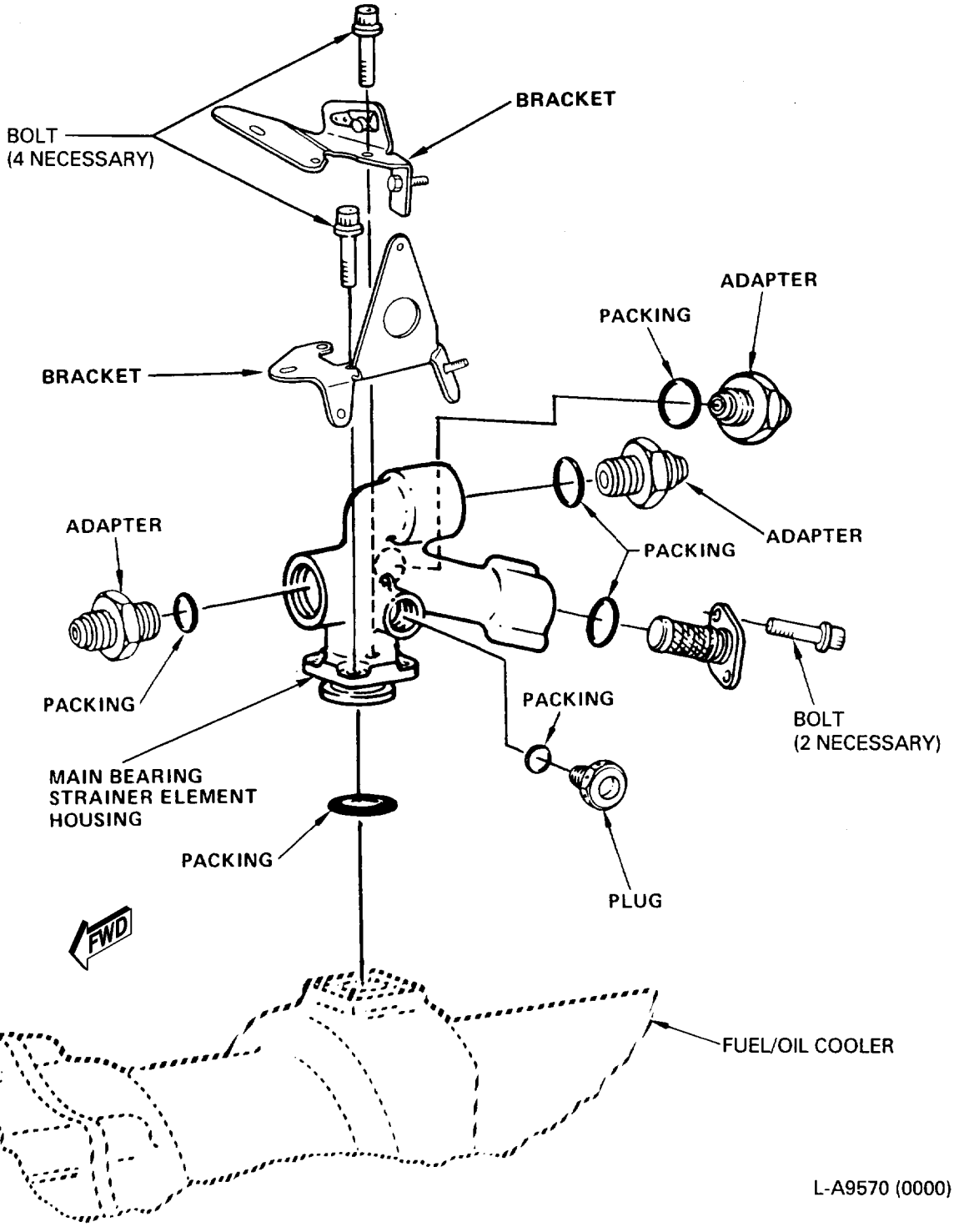
BM5 79 21 41 4 KAME 00

Fuel/Oil Cooler Mounted Main Bearing Strainer Housing
(Sheet 3)
Figure 401



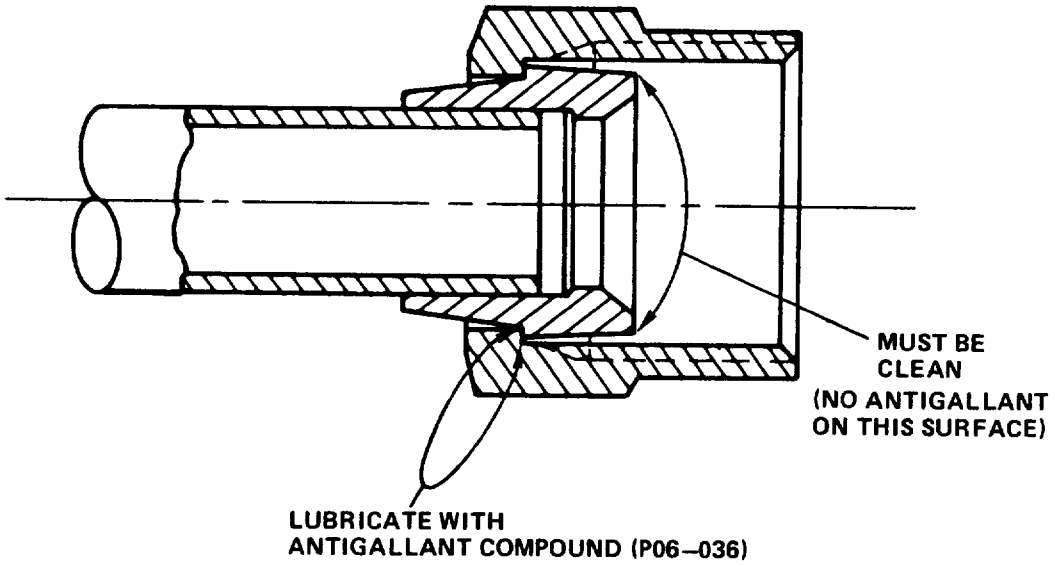
BM5 79 21 41 4 KAMG 00

Fuel/Oil Cooler Mounted Main Bearing Strainer Housing
(Sheet 4)
Figure 401



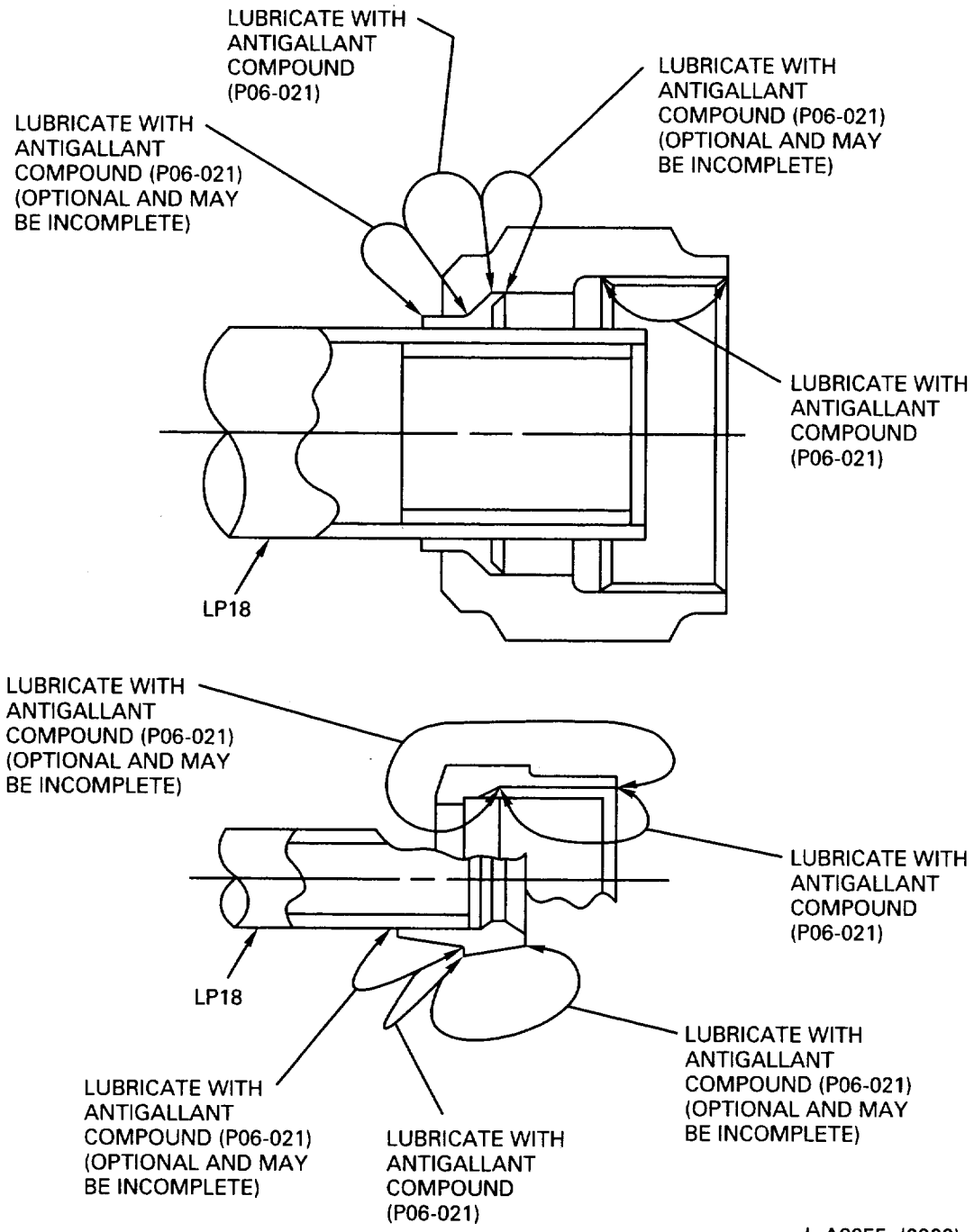
BM5 79 21 41 4 KAMJ 00

Fuel/Oil Cooler Mounted Main Bearing Strainer Housing
(Sheet 4)
Figure 401



BM5 79 21 41 4 KCM0 00

Antigallant Compound Application to Back of Ferrules
(Pre SB PW4ENG 79-52)
Figure 402


LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021)
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021) (OPTIONAL AND MAY BE INCOMPLETE)
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021) (OPTIONAL AND MAY BE INCOMPLETE)
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021)
LP18
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021) (OPTIONAL AND MAY BE INCOMPLETE)
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021)
LP18
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021) (OPTIONAL AND MAY BE INCOMPLETE)
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021) (OPTIONAL AND MAY BE INCOMPLETE)
LUBRICATE WITH ANTIGALLANT COMPOUND (P06-021)
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BM5 79 21 41 4 KEM0 00

Antigallant Compound Application to Back of Ferrules
(Post SB PW4ENG 79-52)
Figure 403

SCAVENGE - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)
Oil collecting in the main bearing compartments and the gearboxes is returned to the oil tank by use of individual scavenge pumps which are located in the same module as the main oil pump. At the inlet to each pump
R is a chip collector. All scavenge oil returning to the tank via the scavenge system passes through a deaerator to remove the entrained air.

2. Scavenge Pumps (Ref. Fig. 001, 002)

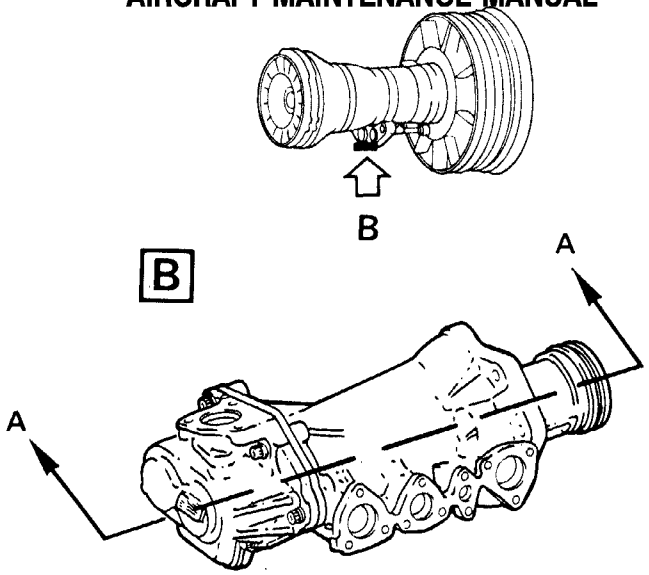
A. The lubrication and scavenge oil pump provides engine oil for lubrication and scavenge functions of the engine bearing compartments and the angle and main gearboxes.

B. The assembly is externally mounted on the aft face of the gearbox and driven by the main gearbox. The assembly is a non-pressure regulated gear pump consisting of six stages : one main lubrication pump and five scavenge pump stages ; one each for the No. 1, 1.5 and 2 bearing compartment, No. 3 bearing compartment, No. 4 bearing compartment, angle gearbox and the main
R gearbox. The inlet of each scavenge pump has metal chip collectors.

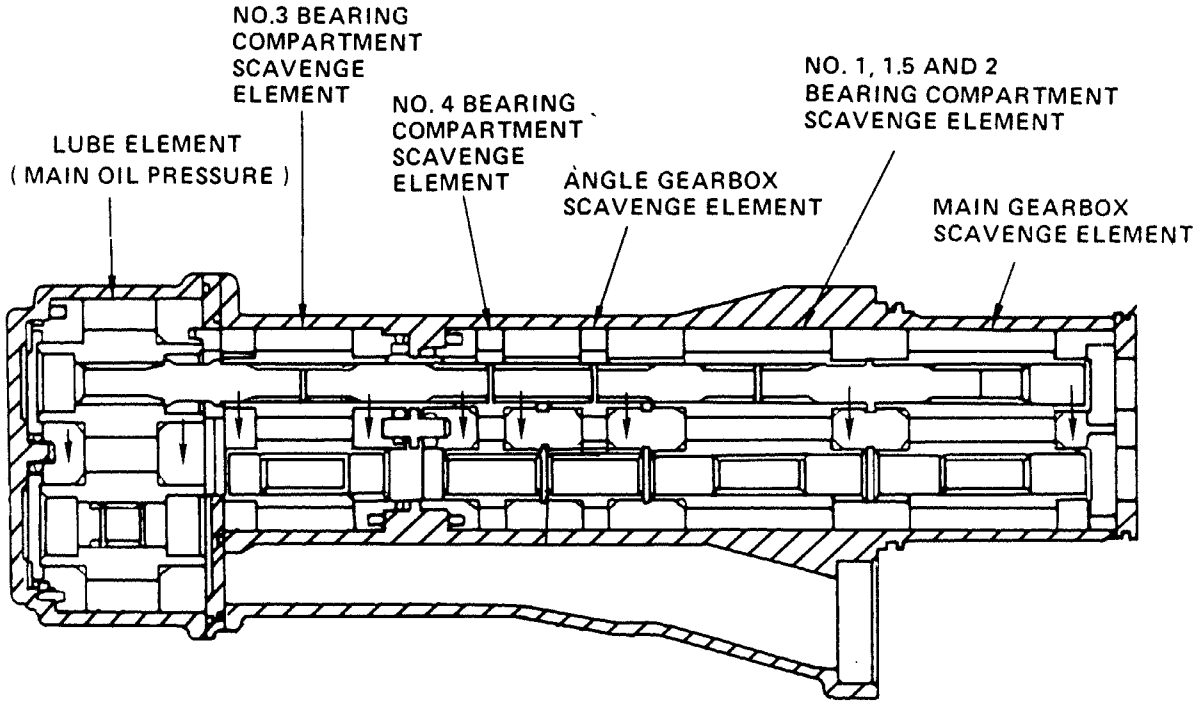
R 3. Magnetic Chip Collectors (Ref. Fig. 002, 003)
NOTE : Configuration of probe grip may differ from that shown in illustration.

R A. There are six pushbutton type magnetic chip collectors on the engine. Four are located at the scavenge ports of the engine lube and scavenge pump. One is located on the forward face of the main gearbox in the sump area. One is located in the oil tank sump.
R Each chip collector assembly consists of a probe and a valve. On the probe is a packing to prevent leakage.
The magnetic probe picks up any ferrous metal particles that are in the oil that contacts the probe. Metal particles found on the probe in the oil tank may originate either in one of the bearing compartments or in the main gearbox. Inspection of the other probes is necessary to pinpoint the origin of the particles. Metal particles on the probes in the lubrication and scavenge oil pump indicate the presence of bearing wear or damage. Metal particles found on the probe in the main gearbox indicate drive gear wear or damage.

B. Oil flows from the oil tank to the lubrication and scavenge oil pump. Under pressure from the oil pump, the oil then flows to the main engine bearings. From the bearings, the oil flows back to the lubrication and scavenge oil pump, and from there to the oil tank.
R (1)The magnetic chip collectors that are in the scavenge ports of the oil pumpwill pick up any metal particles that are in the oil on its return from the main bearings.
R (2)The magnetic chip collector that is in the main gearbox will pick up any metal particles that are in the oil lubricating the main gearbox.
R (3)The magnetic chip collector that is in the oil tank will pick up any



LUBRICATION AND SCAVENGE OIL PUMP


NO.3 BEARING COMPARTMENT SCAVENGE ELEMENT
NO. 4 BEARING COMPARTMENT SCAVENGE ELEMENT
NO. 1, 1.5 AND 2 BEARING COMPARTMENT SCAVENGE ELEMENT
LUBE ELEMENT (MAIN OIL PRESSURE)
ANGLE GEARBOX SCAVENGE ELEMENT
MAIN GEARBOX SCAVENGE ELEMENT

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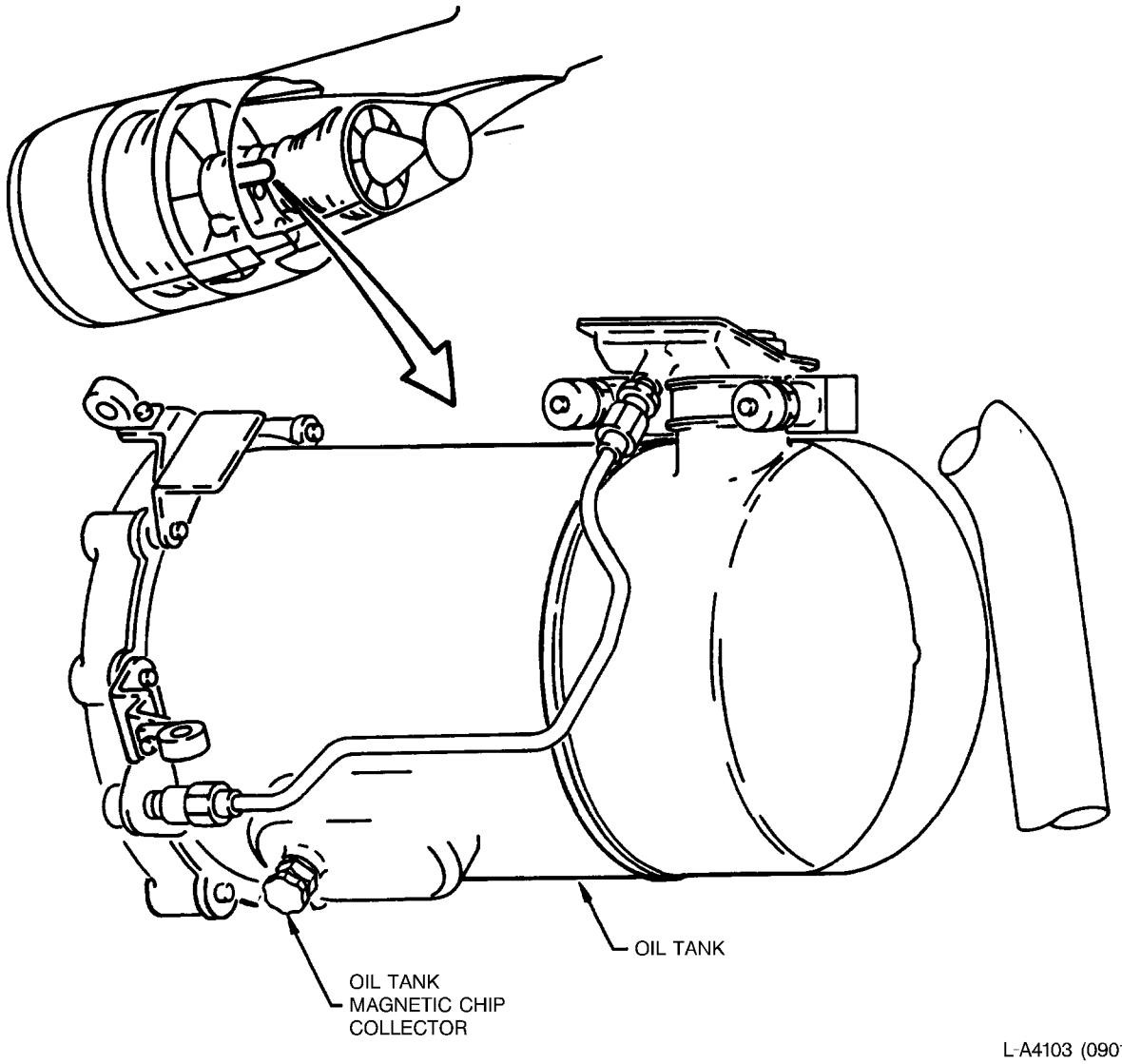
SECTION A – A

Lubrication and Scavenge Oil Pump
Figure 001



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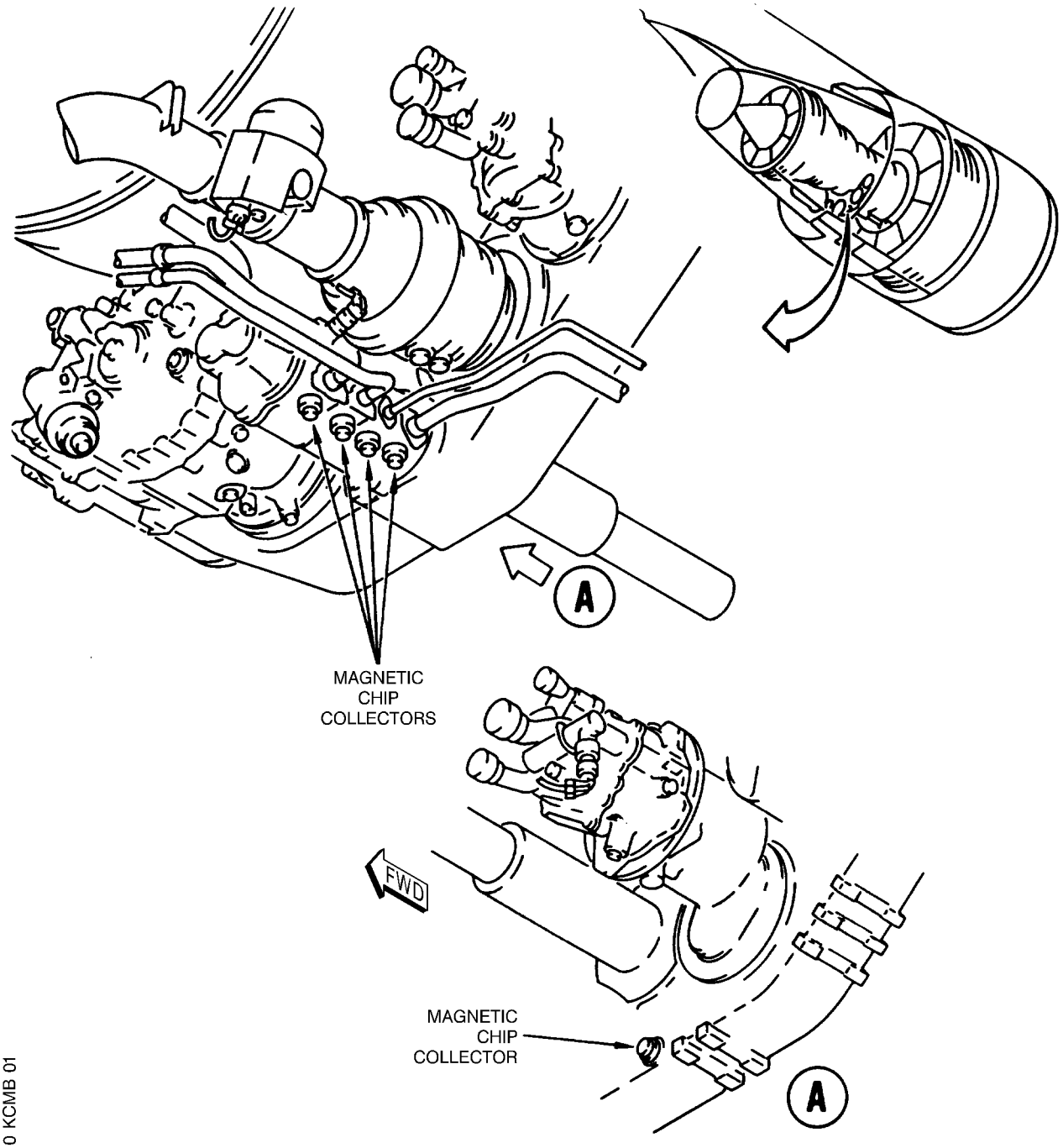
Location of Magnetic Chip Collectors (Sheet 1/2)
Figure 002

R

metal particles that are in the oil passing through the oil tank.

C. In order to remove a magnetic probe for inspection, push on the probe and turn it counterclockwise, then pull the probe out of the valve. As the probe is withdrawn, the valve closes, preventing oil from leaking out.

D. In order to install a magnetic probe, insert the probe in its port and, while pushing on the probe, turn it clockwise. As the probe is inserted into the port, the valve opens and the magnet is again exposed to the engine oil.



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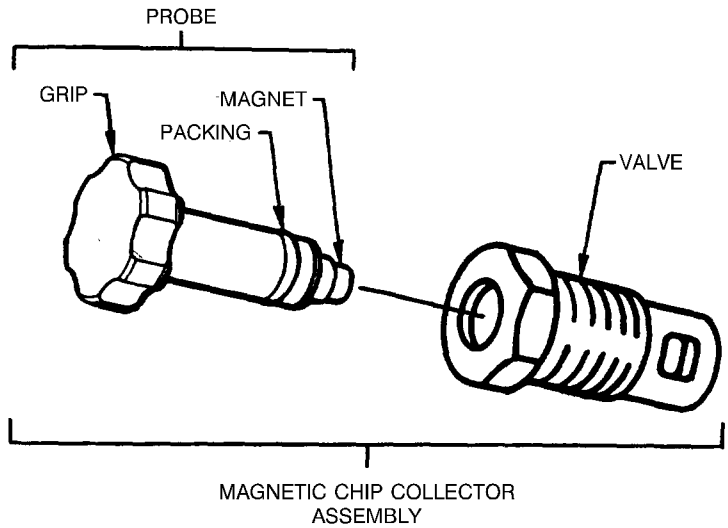
Location of Magnetic Chip Collectors (Sheet 2/2)
Figure 002

R



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R

Magnetic Chip Collector Assembly
Figure 003

R MAGNETIC CHIP COLLECTORS - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Fluid Drain Collector/Container (capacity 10 US gal.) (38.0 liter)
C.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307.
D. Material No.P03-001	Oils (Ref. 70-00-00)
E. Material No.P05-289	Lockwire (AS3214-02)
F. Material No.P05-291	Cable, Safety Cable (Optional)
G. Material No.P05-292	Ferrule, Safety Cable (Optional)
H.	Packings
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 71-00-00, P. Block 501	Power Plant
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401, 402, 403)

R NOTE : To remove the full magnetic chip collector assembly, first remove the probe, then remove the valve. To drain the oil tank, it is
R necessary to remove the full magnetic chip collector assembly.

CAUTION : INSTALL PROTECTIVE COVERS OVER ALL OPENINGS AS SOON AS POSSIBLE TO PREVENT ENGINE DAMAGE.

R CAUTION : DO NOT TRY TO REMOVE THE MAGNETIC CHIP COLLECTOR AS AN ASSEMBLY.
R THE MAGNETIC CHIP COLLECTOR PROBE MUST BE REMOVED FROM THE VALVE
R TO PREVENT DAMAGE TO THE PART.

R (1)Remove the magnetic chip collector from the engine oil tank.
R (a)Remove the PN 50R499 magnetic chip collector from the engine oil tank as follows :
1 Remove the lockwire or safety cable from the valve (4).
2 Put a Fluid Drain Collector/Container under the engine oil tank.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
3 Push the magnetic probe (5) in and turn it counterclockwise to disengage it from the valve.
4 Remove the probe from the valve.
5 Remove the packing (3) from the probe. Discard the packing.
6 Remove the valve from the engine oil tank.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT

WILL BURN BADLY.

7 Let the oil drain into the Fluid Drain Collector/Container.
8 Install the magnetic probe into the valve.
9 Remove the packing (2) from the small OD end of the valve. Discard the packing.
10 Remove the packing (1) from the washer face of the valve. Discard the packing.
11 Remove the probe from the valve again.

R (b)Remove the PN 50R485 magnetic chip collector from the engine oil tank as follows :

1 Remove the lockwire or safety cable from the valve (7).
2 Put a Fluid Drain Collector/Container under the engine oil tank.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
3 Push the magnetic probe (9) in and turn it counterclockwise to disengage it from the valve.
4 Remove the probe from the valve.
5 Remove the packing (8) from the probe. Discard the packing.
6 Remove the valve from the engine oil tank.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
7 Let the oil drain into the Fluid Drain Collector/Container.
8 Install the magnetic probe into the valve.
9 Remove the packing (6) from the small OD end of the valve. Discard the packing.
10 Remove the packing (1) from the washer face of the valve. Discard the packing.
11 Remove the probe from the valve again.

R (c)Remove the PN 50R423 (option) magnetic chip collector from the engine oil tank as follows :

1 Remove the lockwire or safety cable from the valve (10) or (13).
2 Put a Fluid Drain Collector/Container under the engine oil tank.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
3 Push the magnetic probe (12) or (16) in and turn it counterclockwise to disengage it from the valve.
4 Remove the probe from the valve.
5 Remove the packing (11) or (15) from the magnetic probe. Discard the packing.
6 Remove the valve from the engine oil tank.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
7 Let the oil drain into the Fluid Drain Collector/Container.
8 If applicable, remove the packing (14) from the ID of the valve. Discard the packing.
9 Remove the packing (1) from the washer face of the valve. Discard the packing.

R (d)Remove the PN 50R374 magnetic chip collector from the engine oil tank as follows :

1 Remove the lockwire or safety cable from the valve (17).

2 Put a Fluid Drain Collector/Container under the engine oil tank.

WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.

3 Push the magnetic probe (19) in and turn it counterclockwise to disengage it from the valve.

4 Remove the probe from the valve.

5 Remove the packing (18) from the magnetic probe. Discard the packing.

6 Remove the valve from the engine oil tank.

WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.

7 Let the oil drain into the Fluid Drain Collector/Container.

8 Remove the packing (1) from the washer face of the valve. Discard the packing.

CAUTION : INSTALL PROTECTIVE COVERS OVER ALL OPENINGS AS SOON AS POSSIBLE TO PREVENT ENGINE DAMAGE.

R CAUTION : DO NOT TRY TO REMOVE THE MAGNETIC CHIP COLLECTOR
R AS AN ASSEMBLY. THE MAGNETIC CHIP COLLECTOR PROBE MUST BE REMOVED FROM THE VALVE TO PREVENT DAMAGE TO THE PART.

R (2)Remove the magnetic chip collectors from the lubrication and scavenge oil pump.

R (a)Remove the PN 50R342 magnetic chip collectors from the lubrication and scavenge oil pump as follows :

1 Remove the lockwire or safety cable from the valve (2).

2 Put a Fluid Drain Collector/Container under the lubrication and scavenge oil pump.

WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.

3 Push the magnetic probe (4) in and turn it counterclockwise to disengage it from the valve.

4 Remove the probe from the valve.

5 Remove the packing (3) from the probe. Discard the packing.

6 Remove the valve from the lubrication and scavenge oil pump.

WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.

7 Let the oil drain into the Fluid Drain Collector/Container.

8 Remove the packing (1) from the washer face of the valve. Discard the packing.

9 Do this procedure again for the remaining three locations on the lubrication and scavenge oil pump.

R (b)Remove the PN 50R348 magnetic chip collectors from the lubrication and scavenge oil pump as follows :

1 Remove the lockwire or safety cable from the valve (8).

2 Put a Fluid Drain Collector/Container under the lubrication and

scavenge oil pump.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
3 Push the magnetic probe (5) in and turn it counterclockwise to disengage it from the valve.
4 Remove the probe from the valve.
5 Remove the packing (6) from the probe. Discard the packing.
6 Remove the valve from the lubrication and scavenge oil pump.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
7 Let the oil drain into the Fluid Drain Collector/Container.
8 Remove the packing (7) from the ID of the valve. Discard the packing.
9 Remove the packing (1) from the washer face of the valve. Discard the packing.
10 Do this procedure again for the remaining three locations on the lubrication and scavenge oil pump.

R (c)Remove the PN 50R492 magnetic chip collectors from the lubrication and scavenge oil pump as follows :
1 Remove the lockwire or safety cable from the valve (10).
2 Put a Fluid Drain Collector/Container under the lubrication and scavenge oil pump.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
3 Push the magnetic probe (12) in and turn it counterclockwise to disengage it from the valve.
4 Remove the probe from the valve.
5 Remove the packing (11) from the probe. Discard the packing.
6 Remove the valve from the lubrication and scavenge oil pump.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
7 Let the oil drain into the Fluid Drain Collector/Container.
8 Install the magnetic probe (12) into the valve (10).
9 Remove the packing (9) from the small OD end of the valve. Discard the packings.
10 Remove the packing (1) from the washer face of the valve. Discard the packing.
11 Remove the magnetic probe from the valve again.
12 Do this procedure again for the remaining three locations on the lubrication and scavenge oil pump.

R (d)Remove the PN 50R491 magnetic chip collectors from the lubrication and scavenge oil pump as follows :
1 Remove the lockwire or safety cable from the valve (16).
2 Put a Fluid Drain Collector/Container under the lubrication and scavenge oil pump.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT

WILL BURN BADLY.

3 Push the magnetic probe (13) in and turn it counterclockwise to disengage it from the valve.
4 Remove the probe from the valve.
5 Remove the packing (14) from the probe. Discard the packing.
6 Remove the valve from the lubrication and scavenge oil pump.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
7 Let the oil drain into the Fluid Drain Collector/Container.
8 Remove the packing (15) from the ID of the valve. Discard the packing.
9 Remove the packing (1) from the washer face of the valve. Discard the packing.
10 Do this procedure again for the remaining three locations on the lubrication and scavenge oil pump.

R (e)Remove the PN 50R501 magnetic chip collectors from the lubrication and scavenge oil pump as follows :
1 Remove the lockwire or safety cable from the valve (18).
2 Put a Fluid Drain Collector/Container under the lubrication and scavenge oil pump.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
3 Push the magnetic probe (20) in and turn it counterclockwise to disengage it from the valve.
4 Remove the probe from the valve.
5 Remove the packing (19) from the probe. Discard the packing.
6 Remove the valve from the lubrication and scavenge oil pump.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
7 Let the oil drain into the Fluid Drain Collector/Container.
8 Install the magnetic probe (20) into the valve (18).
9 Remove the packing (17) from the small OD end of the valve. Discard the packings.
10 Remove the packing (1) from the washer face of the valve. Discard the packing.
11 Remove the magnetic probe from the valve again.
12 Do this procedure again for the remaining three locations of the lubrication and scavenge oil pump.
CAUTION : INSTALL PROTECTIVE COVERS OVER ALL OPENINGS AS SOON AS POSSIBLE TO PREVENT ENGINE DAMAGE.
R CAUTION : DO NOT TRY TO REMOVE THE MAGNETIC CHIP COLLECTOR AS AN ASSEMBLY. THE MAGNETIC PROBE MUST BE REMOVED FROM THE VALVE TO PREVENT DAMAGE TO THE PART.

R (3)Remove the magnetic chip collector from the center front side of the main gearbox assembly.

R (a)Remove the PN 50R341 magnetic chip collectors from the main gearbox assembly as follows :
1 Remove the lockwire or safety cable from the valve (2).

2 Put a Fluid Drain Collector/Container under the main gearbox assembly.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
3 Push the magnetic probe (4) in and turn it counterclockwise to disengage it from the valve.
4 Remove the probe from the valve.
5 Remove the packing (3) from the probe. Discard the packing.
6 Remove the valve from the main gearbox assembly.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
7 Let the oil drain into the Fluid Drain Collector/Container.
8 Remove the packing (1) from the washer face of the valve. Discard the packing.

R (b)Remove the PN 50R347 magnetic chip collectors from the main gearbox assembly as follows :
1 Remove the lockwire or safety cable from the valve (5).
2 Put a Fluid Drain Collector/Container under the main gearbox assembly.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
3 Push the magnetic probe (8) in and turn it counterclockwise to disengage it from the valve.
4 Remove the probe from the valve.
5 Remove the packing (7) from the probe. Discard the packing.
6 Remove the valve from the main gearbox assembly as follows :
- Hold the bushing with a wrench so it does not turn.
- Remove the valve from the bushing.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
7 Let the oil drain into the Fluid Drain Collector/Container.
8 Remove the packing (6) from the ID of the valve. Discard the packing.
9 Remove the packing (1) from the washer face of the valve. Discard the packing.

R (c)Remove the PN 50R485 magnetic chip collector from the main gearbox assembly as follows :
1 Remove the lockwire or safety cable from the valve (10).
2 Put a Fluid Drain Collector/Container under the main gearbox assembly.
WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.
3 Push the magnetic probe (12) in and turn it counterclockwise to disengage it from the valve.
4 Remove the probe from the valve.
5 Remove the packing (11) from the probe. Discard the packing.

6 Remove the valve from the main gearbox assembly as follows :
- Hold the bushing with a wrench so it does not turn.
- Remove the valve from the bushing.

WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.

7 Let the oil drain into the Fluid Drain Collector/Container.
8 Install the magnetic probe into the valve.
9 Remove the packing (9) from the small OD end of the valve. Discard the packing.
10 Remove the packing (1) from the washer face of the valve. Discard the packing.
11 Remove the probe from the valve again.

R (d)Remove the PN 50R484 magnetic chip collector from the center front side of the main gearbox assembly as follows :
1 Remove the lockwire or safety cable from the valve (13).
2 Put a Fluid Drain Collector/Container under the center front side of the main gearbox assembly.

WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.

3 Push the magnetic probe (16) in and turn it counterclockwise to disengage it from the valve.
4 Remove the probe from the valve.
5 Remove the packing (15) from the probe. Discard the packing.
6 Remove the valve from the main gearbox as follows :
- Hold the bushing with a wrench so it does not turn.
- Remove the valve from the bushing.

WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.

7 Let the oil drain into the Fluid Drain Collector/Container.
8 Remove the packing (14) from the ID of the valve. Discard the packing.
9 Remove the packing (1) from the washer face of the valve. Discard the packing.

R (e)Remove the PN 50R499 magnetic chip collector from the center front side of the main gearbox assembly as follows :
1 Remove the lockwire or safety cable from the valve (18).
2 Put a Fluid Drain Collector/Container under the main gearbox assembly.

WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.

3 Push the magnetic probe (20) in and turn it counterclockwise to disengage it from the valve.
4 Remove the probe from the valve.
5 Remove the packing (19) from the probe. Discard the packing.
6 Remove the valve from the main gearbox assembly as follows :
- Hold the bushing with a wrench so it does not turn.
- Remove the valve from the bushing.

WARNING : BE CAREFUL WHEN YOU DRAIN OIL FROM A HOT ENGINE. HOT OIL IS DANGEROUS. IF IT TOUCHES YOUR BODY OR EYES, IT WILL BURN BADLY.

7 Let the oil drain into the Fluid Drain Collector/Container.
8 Install the magnetic probe into the valve.
9 Remove the packing (17) from the small OD end of the valve. Discard the packing.
10 Remove the packing (1) from the washer face of the valve. Discard the packing.
11 Remove the probe from the valve again.

C. Installation (Ref. Fig. 401, 402, 403)

R 6 NOTE : To install a full magnetic chip collector assembly, first install the valve, then install the probe.

CAUTION : REMOVE PROTECTIVE COVERS FROM THE OPENINGS AS NECESSARY TO PREVENT ENGINE DAMAGE.

R CAUTION : DO NOT TRY TO INSTALL THE CHIP COLLECTOR AS AN ASSEMBLY. YOU MUST REMOVE THE MAGNETIC PROBE FROM THE VALVE TO PREVENT DAMAGE TO THE PARTS.

R (1)Install the magnetic chip collector to the engine oil tank.

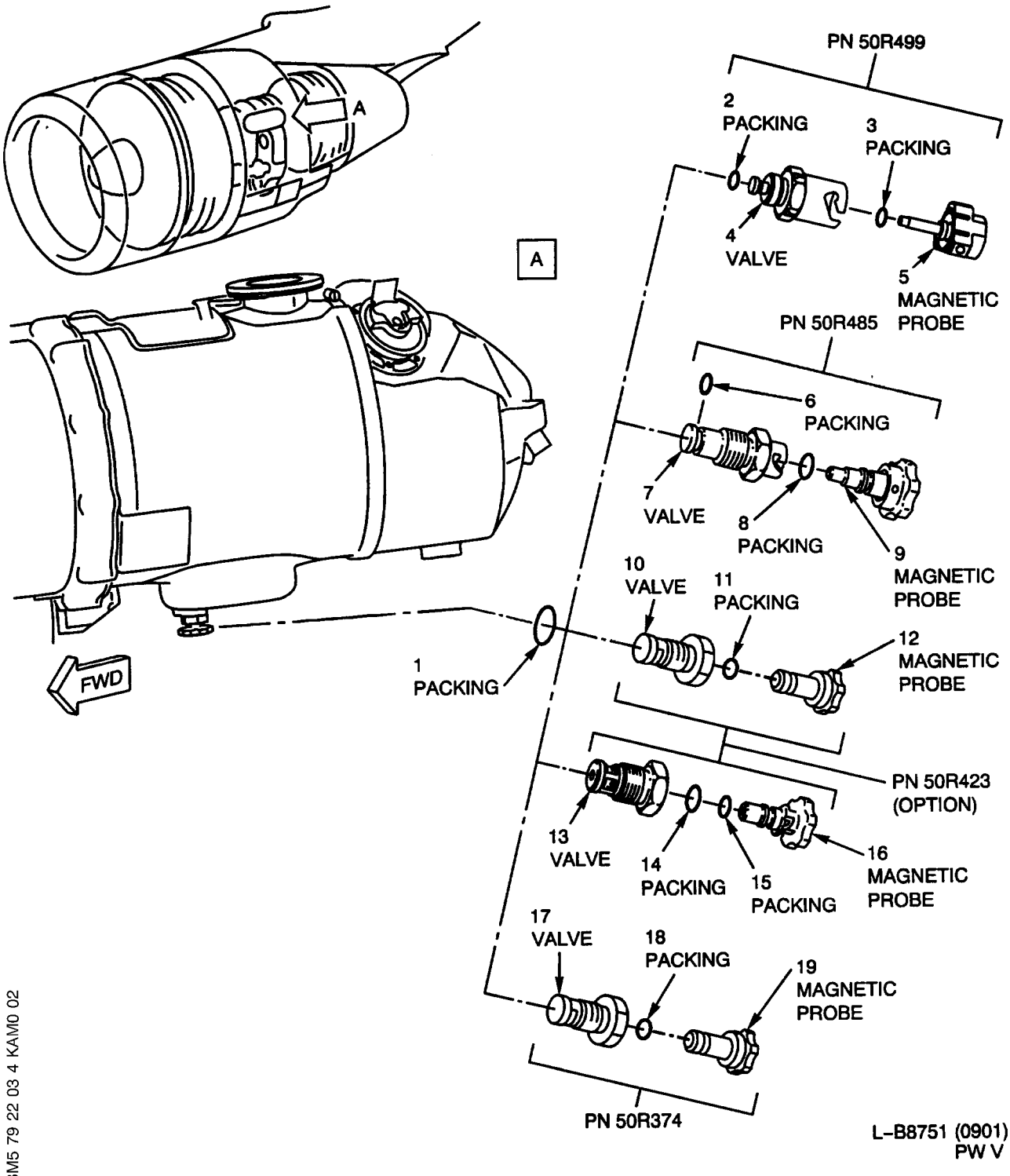
R (a)Install the PN 50R499 magnetic chip collector to the engine oil tank as follows :

1 If necessary, install the magnetic probe (15) into the valve (4) to get access to the packing grooves.
2 Apply Material No.P03-001 to the new packing (2).
3 Install the new packing to the small OD end of the valve.
4 Apply Material No.P03-001 to the new packing (1).
5 Install the new packing to the washer face of the valve.
6 Remove the magnetic probe from the valve.
7 Install the valve into the engine oil tank.
8 TORQUE the valve to 200 - 225 lbf.in. (22.597 - 25.422 N.m).
9 Safety the valve with Material No.P05-289 or Material No. P05-291 and Material No.P05-292.
10 Apply Material No.P03-001 to the new packing (3).
11 Install the new packing to the groove on the magnetic probe.
12 Install the magnetic probe into the valve.
13 Push the magnetic probe in and turn it clockwise until it locks.
14 Pull on the magnetic probe to make sure it is locked.

NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.

R (b)Install the PN 50R485 magnetic chip collector to the engine oil tank as follows :

1 If necessary, install the magnetic probe (9) into the valve (7) to get access to the packing grooves.
2 Apply Material No.P03-001 to the new packing (6).
3 Install the new packing to the small OD end of the valve.
4 Apply Material No.P03-001 to the new packing (1).
5 Install the new packing to the washer face of the valve.
6 Remove the magnetic probe from the valve.
7 Install the valve into the engine oil tank.



BM5 79 22 03 4 KAM0 02

Main Oil Tank Chip Collectors
Figure 401

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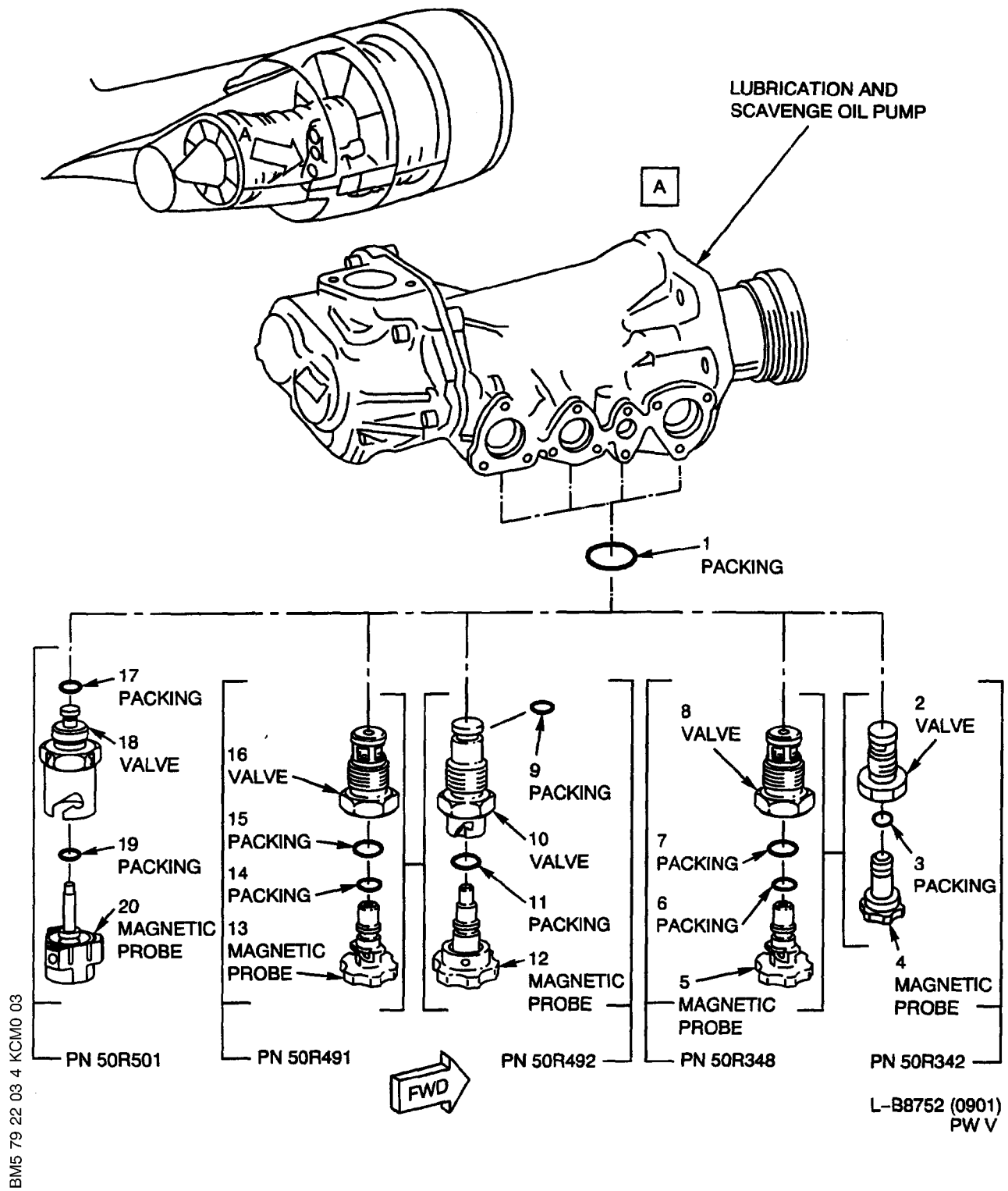

Lubrication and Scavenge Oil Pump Chip Collectors
Figure 402

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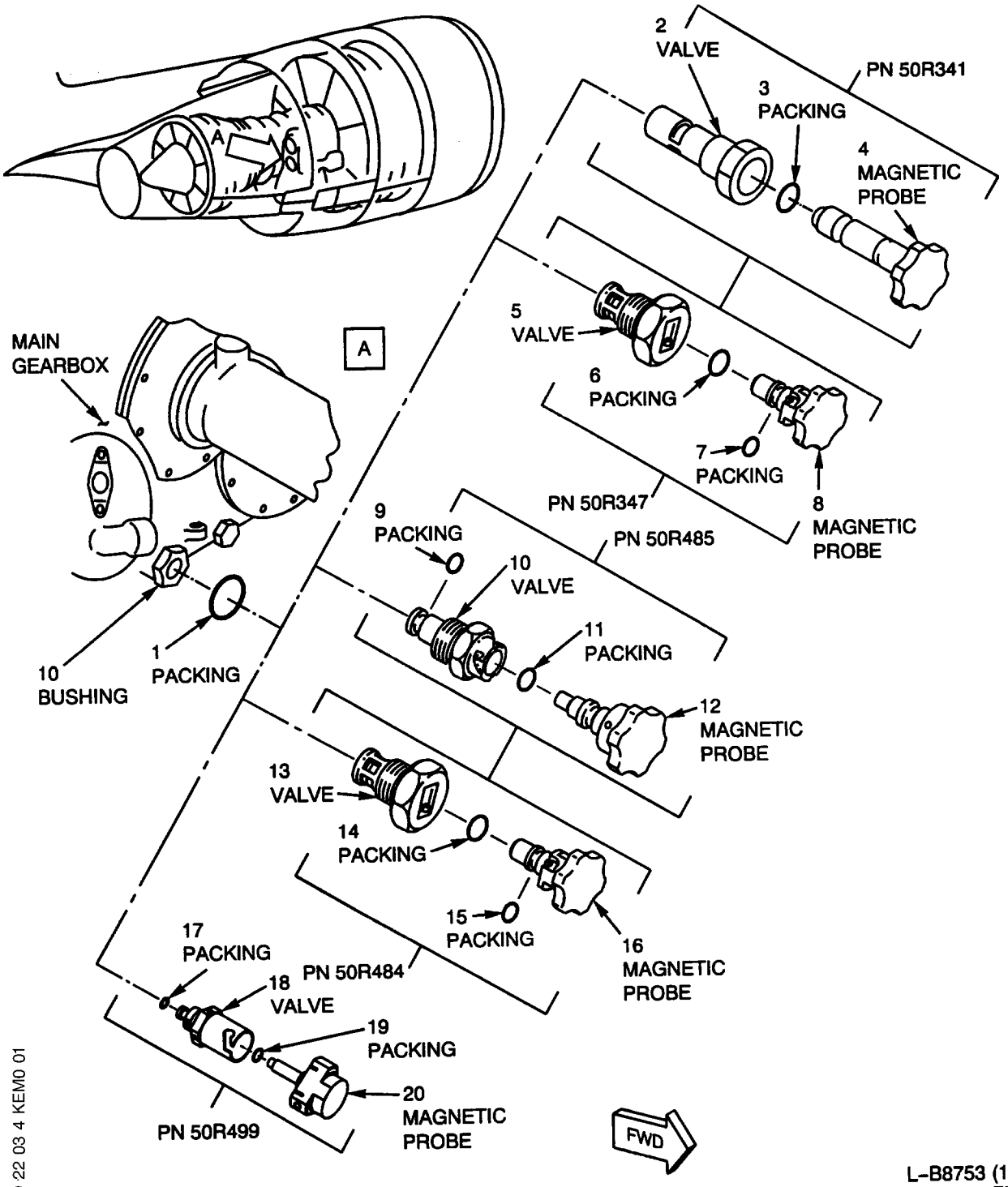

Main Gearbox Chip Collectors
Figure 403

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8 TORQUE the valve to 200 - 225 lbf.in. (22.597 - 25.422 N.m).
9 Safety the valve with Material No.P05-289 or Material No. P05-291 and Material No.P05-292.
10 Apply Material No.P03-001 to the new packing (8).
11 Install the new packing to the groove on the magnetic probe.
12 Install the magnetic probe into the valve.
13 Push the magnetic probe in and turn it clockwise until it locks.
14 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.

R (c)Install the PN 50R423 (option 1) magnetic chip collector to the engine oil tank as follows :
1 Apply Material No.P03-001 to the new packing (1).
2 Install the new packing to the washer face of the valve (10).
3 Install the valve into the engine oil tank.
4 TORQUE the valve to 200 - 225 lbf.in. (22.597 - 25.422 N.m).
5 Safety the valve with Material No.P05-289 or Material No. P05-291 and Material No.P05-292.
6 Apply Material No.P03-001 to the new packing (11).
7 Install the new packing to the groove on the magnetic probe (12).
8 Install the magnetic probe into the valve.
9 Push the magnetic probe in and turn it clockwise until it locks.
10 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.

R (d)Install the PN 50R423 (option 2) magnetic chip collector to the engine oil tank as follows :
1 Apply Material No.P03-001 to the new packing (1).
2 Install the new packing to the washer face of the valve (13).
3 Apply Material No.P03-001 to the new packing (14).
4 Install the new packing to the ID of the valve.
5 Install the valve into the engine oil tank.
6 TORQUE the valve to 200 - 225 lbf.in . (22.597 - 25.422 N.m).
7 Safety the valve with Material No.P05-289 or Material No. P05-291 and Material No.P05-292.
8 Apply Material No.P03-001 to the new packing (15).
9 Install the new packing to the groove on the magnetic probe (16).
10 Install the magnetic probe into the valve.
11 Push the magnetic probe in and turn it clockwise until it locks.
12 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.

R (e)Install the PN 50R374 magnetic chip collector to the engine oil tank as follows :
1 Apply Material No.P03-001 to the new packing (1).
2 Install the new packing to the washer face of the valve (17).
3 Install the valve into the engine oil tank.
4 TORQUE the valve to 200 - 225 lbf.in. (22.597 - 24.422 N.m).
5 Safety the valve with Material No.P05-289 or Material No. P05-291 and Material No.P05-292.

6 Apply Material No.P03-001 to the new packing (18).
7 Install the new packing to the groove on the magnetic probe (19).
8 Install the magnetic probe into the valve.
9 Push the magnetic probe in and turn it clockwise until it locks.
10 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.
CAUTION : REMOVE PROTECTIVE COVERS FROM THE OPENINGS AS NECESSARY TO PREVENT ENGINE DAMAGE.
R CAUTION : DO NOT TRY TO INSTALL THE CHIP COLLECTOR AS AN ASSEMBLY. YOU MUST REMOVE THE MAGNETIC PROBE FROM THE VALVE TO PREVENT DAMAGE TO THE PARTS.

R (2)Install the four magnetic chip collectors to the lubrication and scavenge oil pump.

R (a)Install the PN 50R342 magnetic chip collector to the lubrication and scavenge oil pump as follows :
1 Apply Material No.P03-001 to the new packing (1).
2 Install the new packing to the washer face of the valve (2).
3 Install the valve into the engine oil tank.
4 TORQUE the valve to 90 - 100 lbf.in. (10.169 - 11.298 N.m).
5 Safety the valve with Material No.P05-289 or Material No. P05-291 and Material No.P05-292.
6 Apply Material No.P03-001 to the new packing (3).
7 Install the new packing to the groove on the magnetic probe (4).
8 Install the magnetic probe into the valve.
9 Push the magnetic probe in and turn it clockwise until it locks.
10 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.
11 Do this procedure again for the remaining three locations on the lubrication and scavenge oil pump.

R (b)Install the PN 50R348 magnetic chip collector to the lubrication and scavenge oil pump as follows :
1 Apply Material No.P03-001 to the new packing (1).
2 Install the new packing to the washer face of the valve (8).
3 Apply Material No.P03-001 to the new packing (7).
4 Install the new packing to the ID of the valve.
5 Install the valve into the lubrication and scavenge oil pump.
6 TORQUE the valve to 90 - 100 lbf.in. (10.169 - 11.298 N.m).
7 Safety the valve with Material No.P05-289 or Material No. P05-291 and Material No.P05-292.
8 Apply Material P03-001 to the new packing (6).
9 Install the new packing to the groove on the magnetic probe (5).
10 Install the magnetic probe into the valve.
11 Push the magnetic probe in and turn it clockwise until it locks.
12 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.
13 Do this procedure again for the remaining three locations on the lubrication and scavenge oil pump.

R (c)Install the PN 50R492 magnetic chip collector to the lubrication and

scavenge oil pump as follows :

1 If necessary, install the magnetic probe (2) into the valve (10) to get access to the packing grooves.
2 Apply Material No.P03-001 to the new packing (9).
3 Install the new packing to the small OD end of the valve.
4 Apply Material No.P03-001 to the new packing (1).
5 Install the new packing to the washer face of the valve.
6 Remove the magnetic probe from the valve.
7 Install the valve into the lubrication and scavenge oil pump.
8 TORQUE the valve to 90 - 100 lbf.in. (10.169 - 11.298 N.m).
9 Safety the valve with Material No.P05-289 or Material No. P05-291 and Material No.P05-292.
10 Apply Material No.P03-001 to the new packing (11).
11 Install the new packing to the groove on the magnetic probe.
12 Install the magnetic probe into the valve.
13 Push the magnetic probe in and turn it clockwise until it locks.
14 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.
15 Do this procedure again for the remaining three locations on the lubrication and scavenge oil pump.

R (d) Install the PN 50R491 magnetic chip collector to the lubrication and scavenge oil pump as follows :

1 Apply Material No.P03-001 to the new packing (1).
2 Install the new packing to the washer face of the valve (16).
3 Apply Material No.P03-001 to the new packing (15).
4 Install the new packing to the ID of the valve.
5 Install the valve into the lubrication and scavenge oil pump.
6 TORQUE the valve to 90 - 100 lbf.in (10.169 - 11.298 N.m).
7 Safety the valve with Material No.P05-289 or Material No. P05-291 and Material No.P05-292.
8 Apply Material No.P03-001 to the new packing (14).
9 Install the new packing to the groove on the magnetic probe (13).
10 Install the magnetic probe into the valve.
11 Push the magnetic probe in and turn it clockwise until it locks.
12 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.
13 Do this procedure again for the remaining three locations on the lubrication and scavenge oil pump.

R (e)Install the PN 50R501 magnetic chip collector to the engine oil tank as follows :

1 If necessary, install the magnetic probe (20) into the valve (18) to get access to the packing grooves.
2 Apply Material No.P03-001 to the new packing (17).
3 Install the new packing to the small OD end of the valve.
4 Apply Material No.P03-001 to the new packing (1).
5 Install the new packing to the washer face of the valve.
6 Remove the magnetic probe from the valve.
7 Install the valve into the engine oil tank.
8 TORQUE the valve to 90 - 100 lbf.in. (10.169 - 11.298 N.m).

9 Safety the valve with Material No.P05-289 or Material No. P05-291 and Material No.P05-292.
10 Apply Material No.P03-001 to the new packing (19).
11 Install the new packing to the groove on the magnetic probe.
12 Install the magnetic probe into the valve.
13 Push the magnetic probe in and turn it clockwise until it locks.
14 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.
CAUTION : REMOVE PROTECTIVE COVERS FROM THE OPENINGS AS NECESSARY TO PREVENT ENGINE DAMAGE.
R CAUTION : DO NOT TRY TO INSTALL THE CHIP COLLECTOR AS AN ASSEMBLY. YOU MUST REMOVE THE MAGNETIC PROBE FROM THE VALVE TO PREVENT DAMAGE TO THE PARTS.

R (3)Install the magnetic chip collector to the center front side of the main gearbox assembly.

R (a)Install the PN 50R341 magnetic chip collector to the center front side of the main gearbox assembly as follows :
1 Apply Material No.P03-001 to the new packing (1).
2 Install the new packing to the washer face of the valve (2).
3 Install the valve into the center front side of the main gearbox assembly.
4 TORQUE the valve to 200 - 225 lbf.in. (22.597 - 25.422 N.m).
5 Safety the valve with Material No.P05-289 or Material No. P05-291 and Material No.P05-292.
6 Apply Material No.P03-001 to the new packing (3).
7 Install the new packing to the groove on the magnetic probe (4).
8 Install the magnetic probe into the valve.
9 Push the magnetic probe in and turn it clockwise until it locks.
10 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.

R (b)Install the PN 50R347 magnetic chip collector to the center front side of the main gearbox assembly as follows :
1 Apply Material No.P03-001 to the new packing (1).
2 Install the new packing to the washer face of the valve (5).
3 Apply Material No.P03-001 to the new packing (6).
4 Install the new packing to the ID of the valve.
5 Install the valve into the center front side of the main gearbox assembly.
6 TORQUE the valve to 200 - 225 lbf.in. (22.597 - 25.422 N.m).
7 Safety the valve with Material No.P05-289 or Material no. P05-291 and Material No.P05-292.
8 Apply Material No.P03-001 to the new packing (7).
9 Install the new packing to the groove on the magnetic probe (8).
10 Install the magnetic probe into the valve .
11 Push the magnetic probe in and turn it clockwise until it locks.
12 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.

R (c)Install the PN 50R485 magnetic chip collector to the center front side

of the main gearbox assembly as follows :
1 If necessary, install the magnetic probe (12) into the valve (10) to get access to the packing grooves.
2 Apply Material No.P03-001 to the new packing (9).
3 Install the new packing to the small OD end of the valve.
4 Apply Material No.P03-001 to the new packing (1).
5 Install the new packing to the washer face of the valve.
6 Remove the magnetic probe from the valve.
7 Install the valve into the center front side of the main gearbox assembly.
8 TORQUE the valve to 200 - 225 lbf.in. (22.597 - 25.422 N.m).
9 Safety the valve with Material No.P05-289 or Material No. P05-291 and Material No.P05-292.
10 Apply Material No.P03-001 to the new packing (11).
11 Install the new packing to the groove on the magnetic probe.
12 Install the magnetic probe into the valve.
13 Push the magnetic probe in and turn it clockwise until it locks.
14 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.

R (d)Install the PN 50R484 magnetic chip collector to the center front side of the main gearbox assembly as follows :
1 Apply Material No.P03-001 to the new packing (1).
2 Install the new packing to the washer face of the valve (13).
3 Apply Material No.P03-001 to the new packing (14).
4 Install the new packing to the ID of the valve.
5 Install the valve into the center front side of the main gearbox assembly.
6 TORQUE the valve to 200 - 225 lbf.in. (22.597 - 25.422 N.m).
7 Safety the valve with Material No.P05-289 or Material No. P05-291 and Material No.P05-292.
8 Apply Material No.P03-001 to the new packing (15).
9 Install the new packing to the groove on the magnetic probe (16).
10 Install the magnetic probe into the valve.
11 Push the magnetic probe in and turn it clockwise until it locks.
12 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.

R (e)Install the PN 50R499 magnetic chip collector to the center front side of the main gearbox assembly as follows :
1 If necessary, install the magnetic probe (20) into the valve (18) to get access to the packing grooves.
2 Apply Material No.P03-001 to the new packing (17).
3 Install the new packing to the small OD end of the valve.
4 Apply Material No.P03-001 to the new packing (1).
5 Install the new packing to the washer face of the valve.
6 Remove the magnetic probe from the valve.
7 Install the valve into the center front side of the main gearbox assembly.
8 TORQUE the valve to 200 - 225 lbf.in. (22.597 - 25.422 N.m).
9 Safety the valve with Material No.P05-289 or Material No.

P05-291 and Material No.P05-292.
10 Apply Material No.P03-001 to the new packing (19).
11 Install the new packing to the groove on the magnetic probe.
12 Install the magnetic probe into the valve.
13 Push the magnetic probe in and turn it clockwise until it locks.
14 Pull on the magnetic probe to make sure it is locked.
NOTE : The probe is correctly installed when you align the red mark on the magnetic probe with the red mark on the valve.

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Service the engine oil system (Ref. 12-13-79, P. Block 1).
(3)Close the thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(4)Remove safety clips and tags and close circuit breakers.
(5)Test the engine by the Test Reference Table (Ref. 71-00-00, P. Block 501).

MAGNETIC CHIP COLLECTORS - INSPECTION/CHECK

1. Inspect the Magnetic Chip Collectors

A. Equipment and Materials

ITEM	DESIGNATION
A.	Packing
B. PWA 107014	Photograph, Inspection (Called Photo Aid)
C. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
D. Material No.P11-027	Cleaning Agents (Ref. 70-00-00)
Referenced Procedures	
- 79-21-03, P. Block 401	Oil Filter
- 79-22-03, P. Block 401	Magnetic Chip Collectors

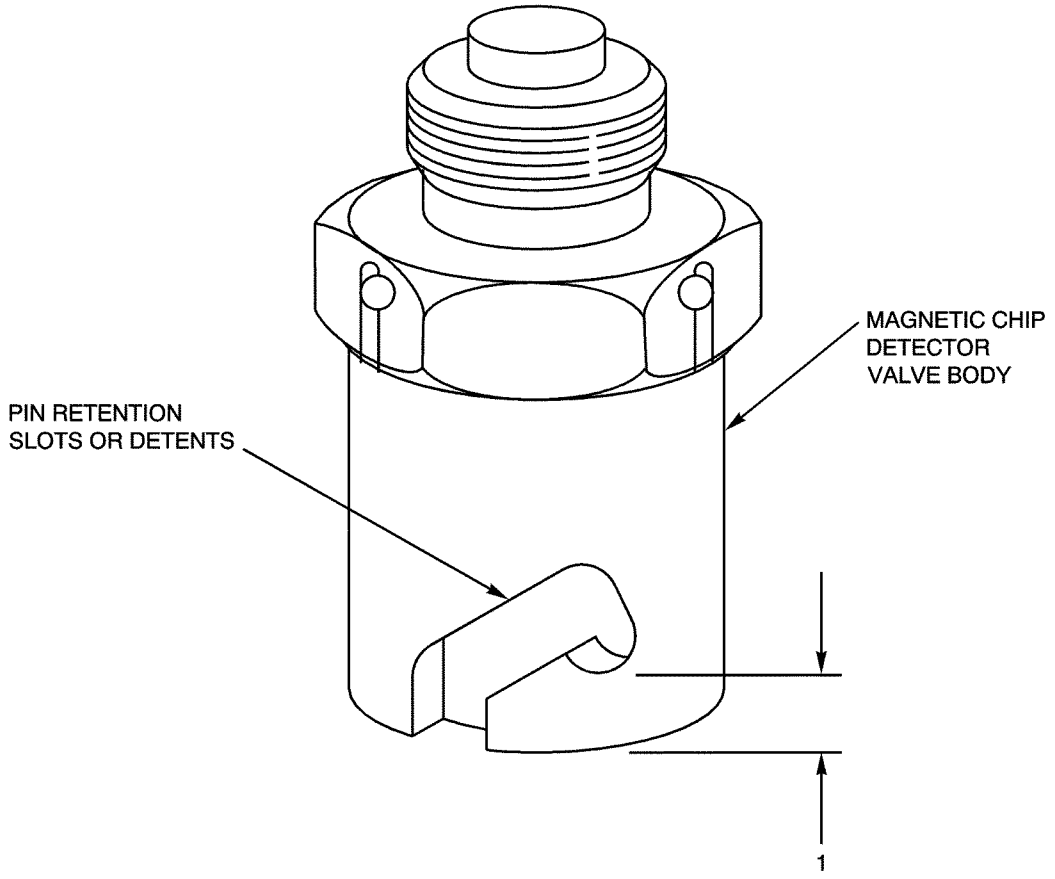
B. Job Set-Up
(1)Remove the magnetic probe from the valve (Ref. 79-22-03, P. Block 401).

C. General
CAUTION : DO NOT PERMIT THE MAGNETS ON THE PROBES TO TOUCH EACH OTHER OR THEY CAN BECOME DEMAGNETIZED.
(1)Upon removal of each probe, you must immediately identify the position of that probe (Ref. Fig. 602).
(2)It is necessary to keep records of all debris contamination that is on the probes and in the oil filter.
(3)You must examine the debris contamination with suitable magnification. Although it is permitted to use magnification, it is recommended that you use a magnifying glass that has 20X magnification.
(4)If the engine or gearbox can not continue in service, you must send the debris contamination and/or analysis of the debris contamination with the engine or gearbox to the repair facility.

D. Magnetic Probes Inspection Procedure
(1)Examine the probes for debris contamination. Use the procedure in the following paragraph "Magnetic Chip Collector Inspection Procedure".
(2)If, after you remove the magnetic probe, oil leaks from the valve, replace the valve packing (Ref. 79-22-03, P. Block 401). If the valve still leaks with the new valve packing, replace the valve.
R (3)(For Post SB PW4ENG 79-88 magnetic chip collectors PN's 50R501 and
R 50R499) Visually examine all six magnetic chip collector valves and
R probes for damage (Ref. Fig. 601).
R (a)Examine the bottom of the three retention grooves in the valve body
R wall for wear.
R (b)If wear if found, measure the thickness of metal at the bottom of
R the three retention grooves. See the referenced figure for the
R minimum serviceable thickness.
R NOTE : You can measure the thickness of the metal at the bottom
R of the three detents with a caliper that can measure up to

R 0.150 in. (3.810 mm).
R 1If the valve body has less than the minimum thickness of material at the bottom of the retention grooves, you must replace the magnetic chip collector valve and probe unless otherwise specified below.
R 2If the material dimension is less than 0.100 in. (2.540 mm), the magnetic chip collector valve and probe is not serviceable. You must replace the magnetic chip collector.
R 3If the material dimension is more than 0.100 in. (2.540 mm) but less than 0.130 in. (3.302 mm), and if a new magnetic chip collector is not available, you can replace the magnetic chip collector at the next A-Check.
R 4To replace the magnetic chip detector valve and probe, refer to 79-22-03, P. Block 401.
R (4)Replace the packing on the probes (Ref. 79-22-03, P. Block 401) (Ref. Fig. 603)
NOTE : The shape of the grip and the quantity of packings can be different from what is shown in the figure.
R (5)Before you install the probes, clean the probes with Material No.P11-027, then dry them with a clean cloth. Make sure that you remove all debris contamination.
R (6)Before you install the probe, do the procedure in the paragraph "Magnetic Chip Collector Probe Functional Check Procedure".

E. Magnetic Chip Collector Inspection Procedure
(1)This procedure gives instructions on how to interpret the debris contamination that is on the magnetic probes. Refer to the paragraph "Spectroscopic Analysis" for information on the methods of quantitative analysis and on the composition of the debris contamination.
(2)There are four main types of debris contamination :
- Contamination from the assembly of the engine (called build debris or residual debris)
- Fines
- Flakes
- Chips
(3)Examine the probe with suitable magnification. If there is debris contamination, make a record of the position of the magnetic probe. Make a record of the quantity and type of debris contamination that is there.
NOTE : The PWA 107014 Photo Aid can be used as an aid showing actual photos of conditions which can be found during a magnetic chip collector (called MCC) inspection.
(a)If the probe is covered by a drop of oil, add a few drops of Isopropyl Alcohol (Material No. P11-014) to the probe tip. The Alcohol should help break the surface tension of the oil and allow the oil to flow down the body of the probe. After a few minutes it is possible for metallic particles to be seen on the probe tip.
NOTE : This condition where the probe tip is covered by a drop of oil is shown in the PWA 107014 Photo Aid (Condition C). This condition is usually the result of fine metallic particles holding the oil near the collector and the reason for performing the preceding step whenever these conditions are



1. 0.130 IN. (3.302 MM) MINIMUM

L-D3990 (0308)
PW V

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Magnetic Chip Collector (Post SB PW4ENG 79-88)
Dimensional Inspection
Figure 601

R

found.

(4)In the following steps, if there is a question of what type of debris contamination that you see, obey the action that follows the stricter interpretation.

(5)Build debris or residual debris
(Ref. Fig. 604, 608).

NOTE : The PWA 107014 Photo Aid (see condition A) can be used as an aid showing actual photos of conditions which can be found during an MCC inspection.

(a)Description
Build debris normally collects during the early stages, the first 1000 hours of engine operation after assembly of the engine. Build debris can look like strands of curly steel wool, shavings or burrs.

(b)Source
This is residual material that is accidentally left in or enters the engine at assembly. Build debris typically comes from machining operations when the components are made or assembled.

(c)Action
The engine can continue in service. Obey the usual magnetic probe inspection interval.

NOTE : "Usual magnetic chip collector inspection interval" is the interval that the individual operator has established as part of their approved maintenance program.

1 After 1000 hours of post build operation, do an analysis of chips or flakes (these are not specified as build or residual debris).

2 See Tables 601, 602 and 603 for a list of the composition and location of various commonly used bearing and gear materials.

(6)Magnetic fines
(Ref. Fig. 605, 608)

(a)Description
These are very small particles. They are less than 0.010 in. (0.254 mm) long and of different widths. They can show as a black or gray sludge or fuzz on the magnetic probe. When the oil on the probe is removed, they show as dull hair-like slivers. Fines are typical of low-time engines and small quantities are serviceable.

(b)Source
The usual wear of various engine components can cause a small quantity of fines. This is a serviceable condition. Bearing skid and the spinning of parts such as spacers, seal plates and shaft plugs can also cause fines. Bearing skid and spinning make fines at a higher rate than usual wear. This is not a serviceable condition. Service experience shows that only the deoiler idler gear bearing in the main gearbox is subject to bearing skid that can generate fines.

(c)Action
If fines are collected on the probe tip, do as follows :

1 If the fines collected on the probe tip make up less than 25 percent of the probe tips perimeter (See PWA 10714 Photo Aid Condition B) and (Ref. Fig. 608), the engine can continue in service. Obey the usual magnetic chip detector inspection interval.

2 If the fines collected on the probe tip make up more that 25 percent

of the probe tips perimeter (Ref. Fig. 608), (also PWA 107014 Photo Aid, Condition E shows a non acceptable amount of fines), examine the individual compartment chip collectors for debris.

3 If any individual MCC probe has 100 percent coverage of fines, the engine must be removed from service.

4 If there is debris on more than 25 percent of any of the individual probe tips perimeter (Ref. Fig. 605), (also PWA 107014 Photo Aid shows a non acceptable amount of fines as Condition E) and less than 100 percent surface coverage, then examine the main oil filter element, the filter housing, and filter housing oil for debris as specified in the following step.

(d)If there is debris on more than 25 percent of any of the individual probe tips perimeter and less than 100 percent surface coverage, do the steps that follow :

1 Remove the main oil filter (Ref. 79-21-03, P. Block 401). Keep the oil that you drain from the main oil filter housing.

2 Flush the filter with Material No.P11-027.

3 Strain the solvent through filter paper or clean cloth. Keep the debris contamination for identification.

4 Install a new main oil filter (Ref. 79-21-03, P. Block 401).

5 Examine the main oil filter and filter housing oil for metallic debris contamination. If there is metallic debris contamination that is not build debris and if the quantity is sufficient to make a circle that has a diameter of 0.50 in. (12.700 mm) minimum, the engine is not not serviceable.
Disassemble the engine and find the source of the debris contamination.

6 If there is metallic debris contamination other than build debris in the main oil filter and the filter housing oil, and the debris contamination is not sufficient to make a circle that has a diameter of 0.50 in. (12.700 mm) minimum, do the steps that follow :

- Continue the engine in service. Also, examine the magnetic probes every 25 hours for 100 flight hours.
- Collect the debris contamination from the magnetic probes and do a spectroscopic analysis of the material within 100 flight hours. If there is debris contamination from bearing or gear material, remove the engine from service, disassemble the engine, and find the source of the material.
- If the debris contamination is the same or increases in consecutive magnetic probe inspections during the 100 flight hours inspection interval, remove the engine from service. Disassemble the engine to find the source of the debris contamination.
- If you do not find bearing or gear material, and if the quantity of debris contamination decreases in consecutive inspections of the probes during the 100 flight hours inspection interval, return the engine to service.

(7)Chips or flakes
(Ref. Fig. 606, 607, 608)

NOTE : The PWA 107014 Photo Aid (Conditions D and F) can be used as an aid showing actual photos of conditions which can be found during an magnetic chip collector inspection.

(a)Description of chips
These are very thick pieces of metal. Usually one surface is a smooth machined surface ; the opposite surface is rough and irregular.

(b)Source of chips
Chips from ball and roller bearings are usually smooth and shiny on one side. This side may show the original honing/grinding process. The opposite side is duller and has a fractured appearance. Chips from gearteeth have one shiny side with machine marks and one side that is smooth and dull.

(c)Description of flakes
Flakes have an irregular shape, but are usually flat and shiny on both sides. You must do an analysis of them to know their source.

(d)Source of flakes
Flakes come from ball bearings, roller bearings and gearteeth. Flakes from ball and roller bearings are very thin : 0.002 - 0.010 in. (0.051 - 0.254 mm) thick. They usually have an irregular, plate-like shape and have radial cracks. When the flake is cleaned, it is much brighter than other types of debris contamination. Flakes from gearteeth are shiny, long, and thin, and can have an irregular shape. They are usually thicker and not as bright as ball or roller bearing flakes.

(e)If there are five or more flakes or chips on the magnetic probe, the engine is not serviceable. Do a spectroscopic analysis of the debris contamination.
Refer to Tables 601 and 602. Disassemble the engine and find the source of the debris contamination.

(f)Combination of chips/flakes, and fines
If a combination of both chips/flakes, and fines are collected on the probe, follow the chips/flakes path on (Ref. Fig. 608).

(g)If there are chips or flakes on a probe, but less than five chips or flakes, do the steps that follow.

1 Remove the main oil filter (Ref. 79-21-03, P. Block 401). Keep the oil that you drain from the main oil filter housing.

2 Flush the filter with Material No.P11-027.

3 Strain the solvent through filter paper or clean cloth. Keep the debris contamination for identification.

4 Install a new main oil filter (Ref. 79-21-03, P. Block 401).

5 Examine the main oil filter and the filter housing oil for debris contamination. If there is metallic debris contamination in the main oil filter and filter housing oil, and the contamination is not build debris, and the quantity is sufficient to make a circle that has a diameter of 0.50 in. (12.700 mm) minimum, do not use the engine. Disassemble the engine and find the source of the debris contamination.

6 If there is metallic debris contamination other than build debris in the main oil filter and filter housing oil, and the debris contamination is not sufficient to make a circle that has a diameter of 0.50 in. (12.700 mm) minimum, do the steps that follow :

R
- Continue the engine in service, but do an inspection of the magnetic probes every 25 hours for 100 flight hours.
- Collect the debris contamination from the magnetic probes and do

R a spectroscopic analysis of the material within 100 flight hours. If there is debris contamination from bearing or gear material, remove the engine from service. Disassemble the engine and find the source of the material.

- If the debris contamination is the same or increases in consecu-
R tive magnetic probe inspections during the 100 flight hour inspection interval, remove the engine from service. Disassemble the engine to find the source of the debris contamination.
- If you do not find bearing or gear material, and if the quantity of debris contamination decreases in consecutive magnetic probe
R inspections during the 100 flight hour inspection interval, continue the engine in service.

F. Spectroscopic Analysis of Chips and Flakes
See Tables 601, 602 and 603

(1) The objective of this analysis is to obtain a quantitative estimate of the relative concentrations of metallic elements in the chips, a compositional fingerprint that can be compared to elemental profiles of known oil-wetted materials for purposes of identifying the source of the debris contamination. One of several spectroscopic methods can be used, depending upon the homogeneity and quantity of chips. The methods and advantages/disadvantages of each are listed below :

Spectroscopic Method	Advantages/Disadvantages
Scanning Electron Microscopy/ Energy Dispersive X-ray Spectrometry (SEM/EDX)	This technique is particularly useful when the chips appear reterogeneous, since the small diameter of the electron beam allows special resolution of areas as small as 0.1 micrometers. Care must be taken when using the technique to sample several areas to avoid the possibility of an unrepresentative analysis.
Inductively Coupled Plasma/ Optical Emission Spectrometry (ICP/OES)	This technique is highly accurate and useful when a large quantity (several milligrams) of material are available for analysis. The technique is relatively laborious, however, as the chips must be digested (dissolved) in an acid solution prior to analysis. This method is therefore recommended only when it is desirable to sample a lot of material at one time, or if it is the only equipment available.
Wavelength Dispersive X-ray Fluorescence Spectrometry	This technique should only be used when a moderate amount of homogen-

Spectroscopic Method	Advantages/Disadvantages
(WDXRF)	eous material is present on the MCC. The advantage of this technique is the great speed with which an analysis can be performed.
Spark- or Arc-Source Optical Emission Spectrography	This technique is quite laborious, and only semiquantitative. It should only be used when general, non-definitive information is required.

(2) In all of the techniques described above, the best analysis will be obtained when the equipment is calibrated using well-characterized standard materials, similar in composition to the sample. The stability and relative specificity of modern equipment, however, allows some useful information to be gathered with less rigorous calibration. Interpretation of this type of data is difficult, however, and should be carried out only by a trained atomic spectroscopist.

	Bearing Material	
	AMS 6441 AISI 52100 PWA-723 Min. - Max. (Percent)	AMS 6490 PWA-725 (M-50) PWA-793 (M-50) Min. - Max. (Percent)
Carbon	0.95 - 1.10	0.77 - 0.85
Manganese	0.25 - 0.45	-- 0.35
Silicon	0.20 - 0.35	-- 0.25
Phosphorous	-- 0.025	-- 0.015
Sulphur	-- 0.025	-- 0.015
Chromium	1.30 - 1.60	3.75 - 4.25
Nickel	-- 0.15	-- 0.15
Molybdenum	-- 0.10	4.00 - 4.50
Copper	-- 0.15	-- 0.10
Vanadium	-- --	0.90 - 1.10
Cobalt	-- --	-- 0.25
Tungsten	-- --	-- 0.25

	Bearing Material	
	AMS 6441 AISI 52100 PWA-723 Min. - Max. (Percent)	AMS 6490 PWA-725 (M-50) PWA-793 (M-50) Min. - Max. (Percent)
Iron	Remainder	Remainder

Mineral Composition of Bearing Material
Table 601

	Gear Material AMS 6265 Min. - Max. (Percent)
Carbon	0.07 - 0.13
Manganese	0.40 - 0.70
Silicon	0.20 - 0.35
Phosphorous	-- 0.025
Sulphur	-- 0.025
Chromium	1.00 - 1.40
Nickel	3.00 - 3.50
Molybdenum	0.08 - 0.15
Copper	-- 0.35
Vanadium	-- --
Cobalt	-- --
Tungsten	-- --
Iron	Remainder

Mineral Composition of Gear Material
Table 602

Magnetic Probe	BEARINGS M-50	BEARINGS AISI 52100	GEARS AMS 6265
No. 1, 1.5, 2 bearing compartments	X	X	X
Angle gearbox	X	X	X
No. 4 bearing compartment	X	X	
No. 3 bearing compartment	X		
Main gearbox	X	X	X
Oil tank	X	X	X

Table 603

(3)Contamination of the oil due to introduction of hydraulic fluid (skydrol) is serious. At engine operating temperature hydraulic fluid reacts with synthetic oils to form a thick gummy substance which could block or drastically retard oil flow through jets, nozzles, or fine mesh screens.

(a)Whenever a hydraulic pump failure occurs, whenever metal parts in the cavity between hydraulic pump and gearbox pad are found corroded or whenever an appreciable accumulation of hydraulic fluid is found in this cavity the following inspections should be made.

1 Remove carbon seal from the hydraulic pump drive in the gearbox.

2 Inspect condition of preformed packing which seals carbon seal support to gearbox. Deteriorated preformed packing seals indicate that engine oil may be contaminated with hydraulic fluid.

3 Inspect condition of carbon seal.

4 Inspect driveshaft bearings support by attempting to move drive spline axially and radially.
Detectable looseness indicates a bearing problem wich must be corrected prior to further flight.

5 Take sample of engine oil to be analyzed for possible hydraulic fluid contamination.

(b)If contamination of oil by hydraulic fluid or jet fuel is confirmed or suspected, following procedure should be performed. See Table 604.

1 Drain main oil tank, flush and re-service with new oil.

2 Drain gearbox of any residual oil.

3 Replace main oil filter.

4 Restore engine to operable configuration by installing items removed in step (a), using new packings or seals.

5 Operate engine at idle to warm oil, accelerate to part power and return to idle five times, run at part power for 20 minutes and shut down.

6 Take oil sample and analyse for contamination.

If oil shows contamination during this second analysis, repeat step (b) procedure.
NOTE : Engine may be continued-in-service while this second oil sample is being analysed.

Percentage of Dilution	Permissible Engine Operating Time (While Contaminated)
Up to 10 Percent	Unlimited
10 to 25 Percent	Up to 10 Hours
25 to 50 Percent	Up to 2 Hours
Above 50 Percent	Momentary (Provided Maximum Thrust Was Not Used)

If engine exceeds operating time limits specified for degree of contamination found, it must be dissassembled for inspection of all main bearings.
If engine's operating time while contamined was within limits given, only oil system flushing and main oil filter or strainer checks described in Step F.(3)(b) are required.

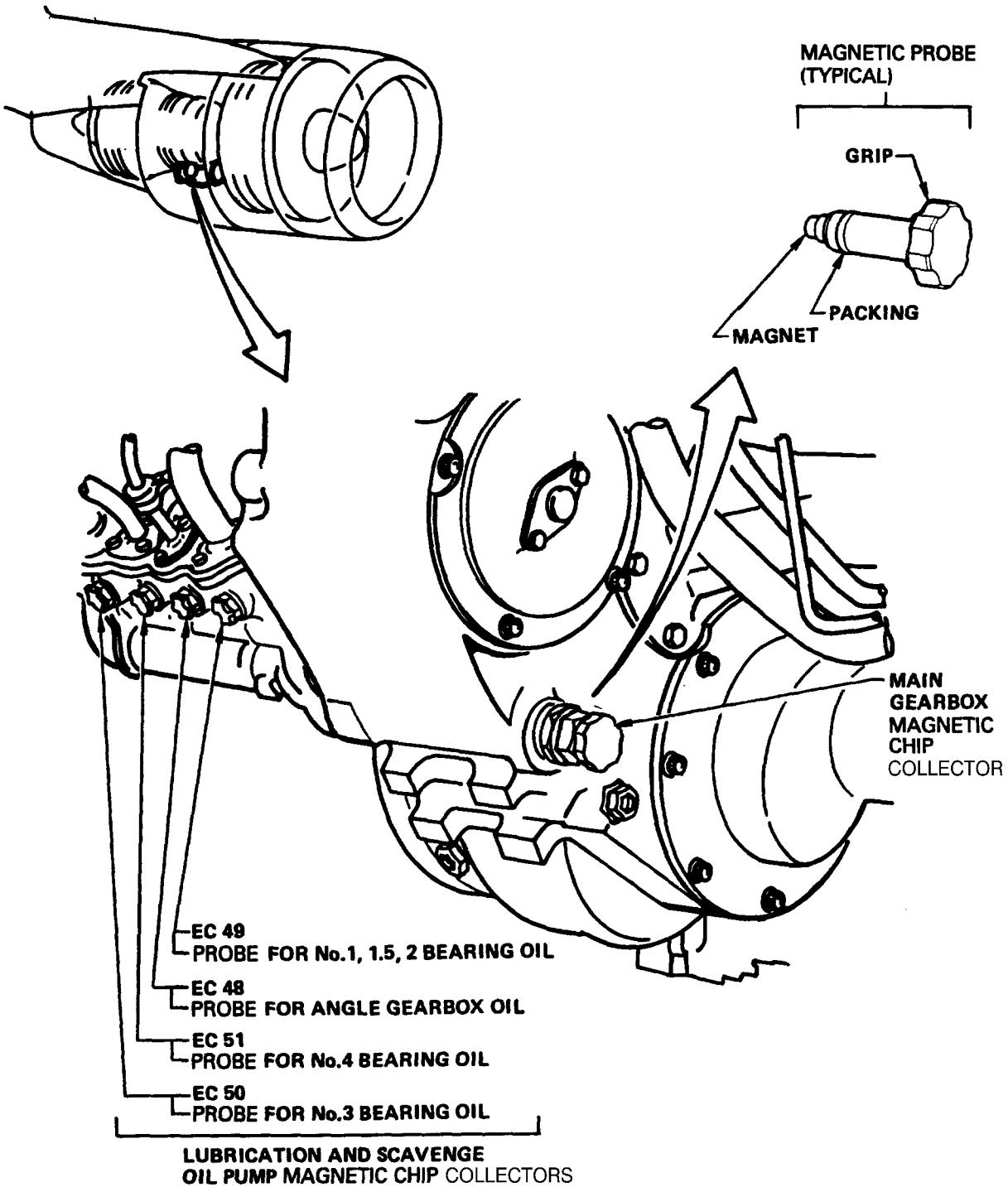
Table 604

G. Analyzing Oil For Contamination
(1)Sample exhibiting viscosity appreciably lower than that of a sample of same brand of oil which is known to be non-contaminated, is an indication of contamination by either jet fuel or hydraulic fluid.
(2)Contamination of oil by hydraulic fluid can best be detected by measuring phosphorous content, either by wet chemical test (ASTM-D-1091-64) or by spectographic oil analysis. Phosphorous content higher than that for a sample of same brand of oil which is known to be non-contaminated is an indication of contamination by hydraulic fluid.

H. Magnetic Chip Collector Probe Functional Check Procedure
CAUTION : DO NOT PERMIT THE MAGNETS ON THE MAGNETIC PROBES TO TOUCH EACH OTHER OR THEY CAN BECOME DEMAGNETIZED.
(1)Do a check of the magnetic strength of the probe with the applicable check as follows :
(a)Preferred method - Have a magnetic probe pick up a 1.00 in. (25.4 mm) diameter carbon steel ball bearing. If the ball is not available, perform the method described in the step as follows.
(b)Optional Method - Hang the magnetic probe on a horizontal steel surface so that the magnet has to fully support the weight of the probe.
NOTE : This is not the preferred strength test but can be used at stations that do not have a 1.00 in. (25.4 mm) diameter carbon steel bearing required to perform the preferred method.
(2)If any of magnetic probes do not operate correctly, replace the

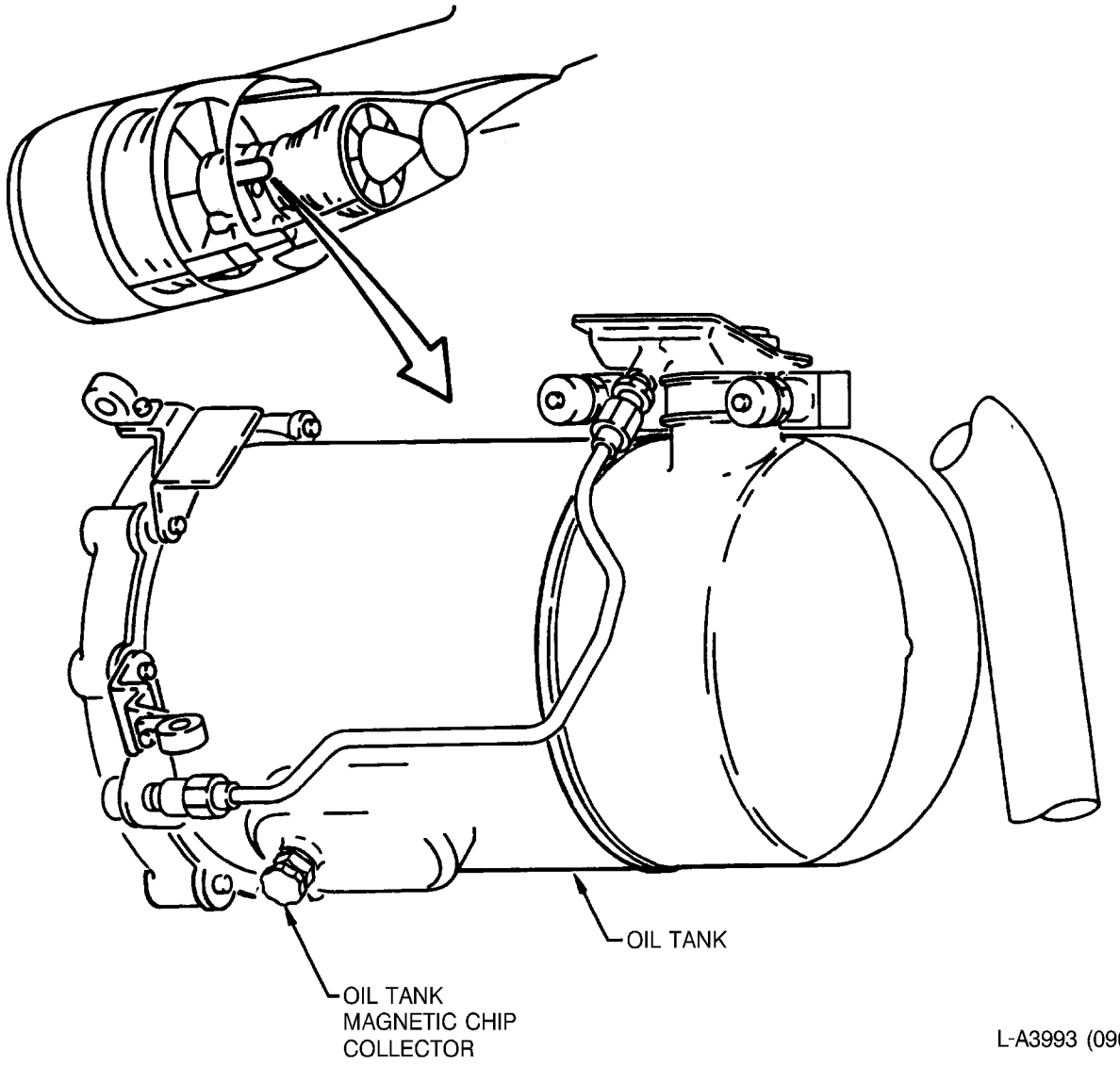
magnetic chip detector assembly.

I. Close-Up
(1)Install the magnetic probe in the valve (Ref. 79-22-03, P. Block 401).



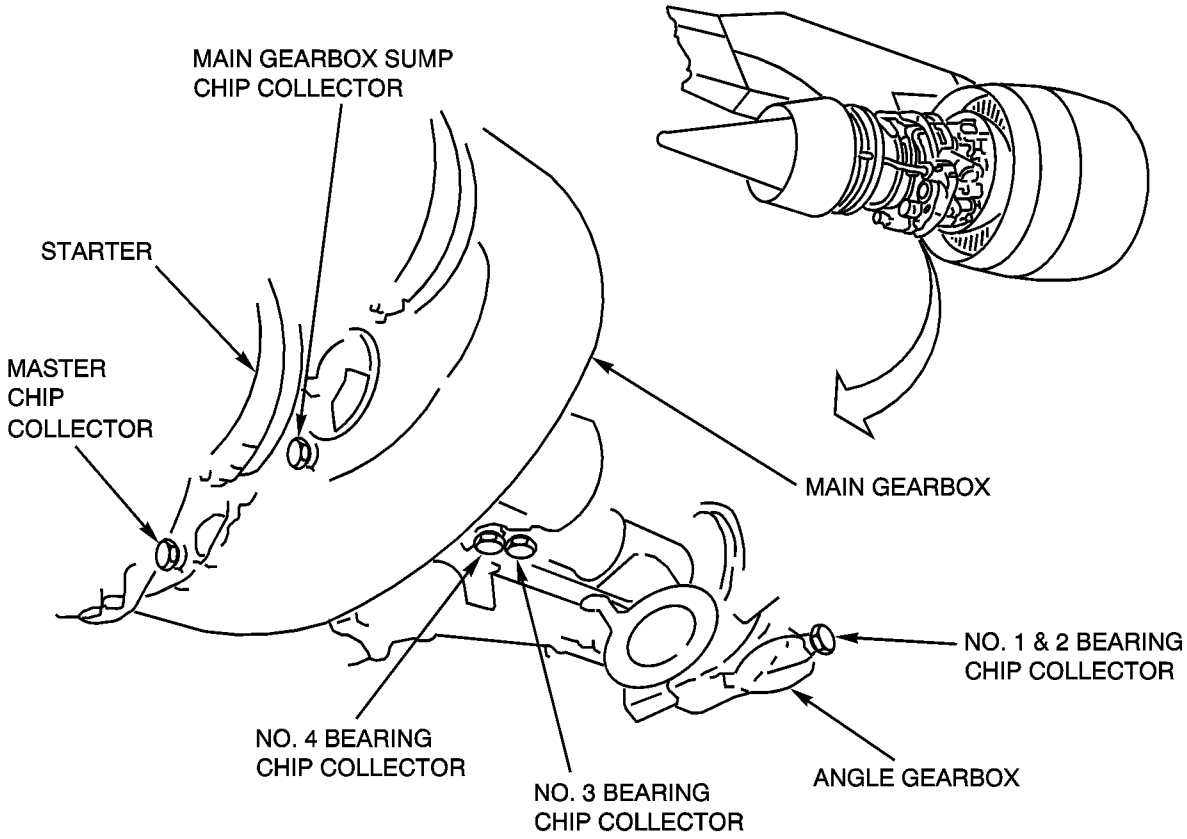
BM5 79 22 03 6 KAMA 03

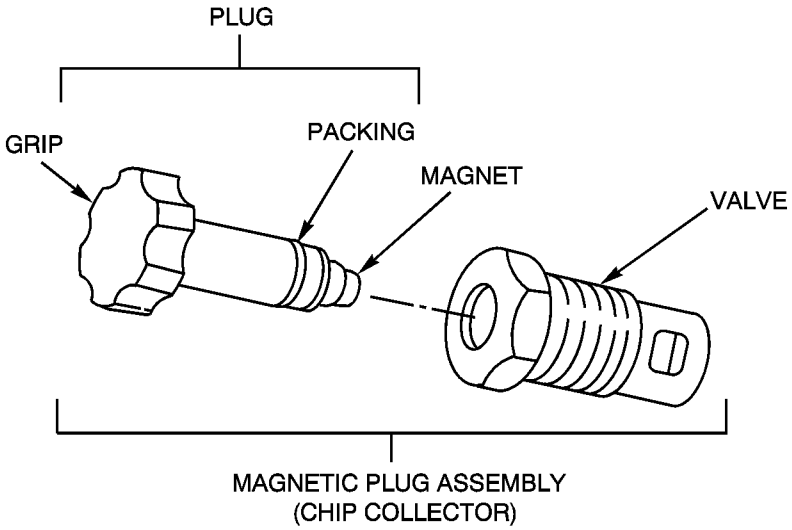
Positions of the Magnetic Chip Collector Assemblies
(Sheet 1/2)
Figure 602



BM5 79 22 03 6 KAMC 03

Positions of the Magnetic Chip Collector Assemblies
(Sheet 2/2)
Figure 602





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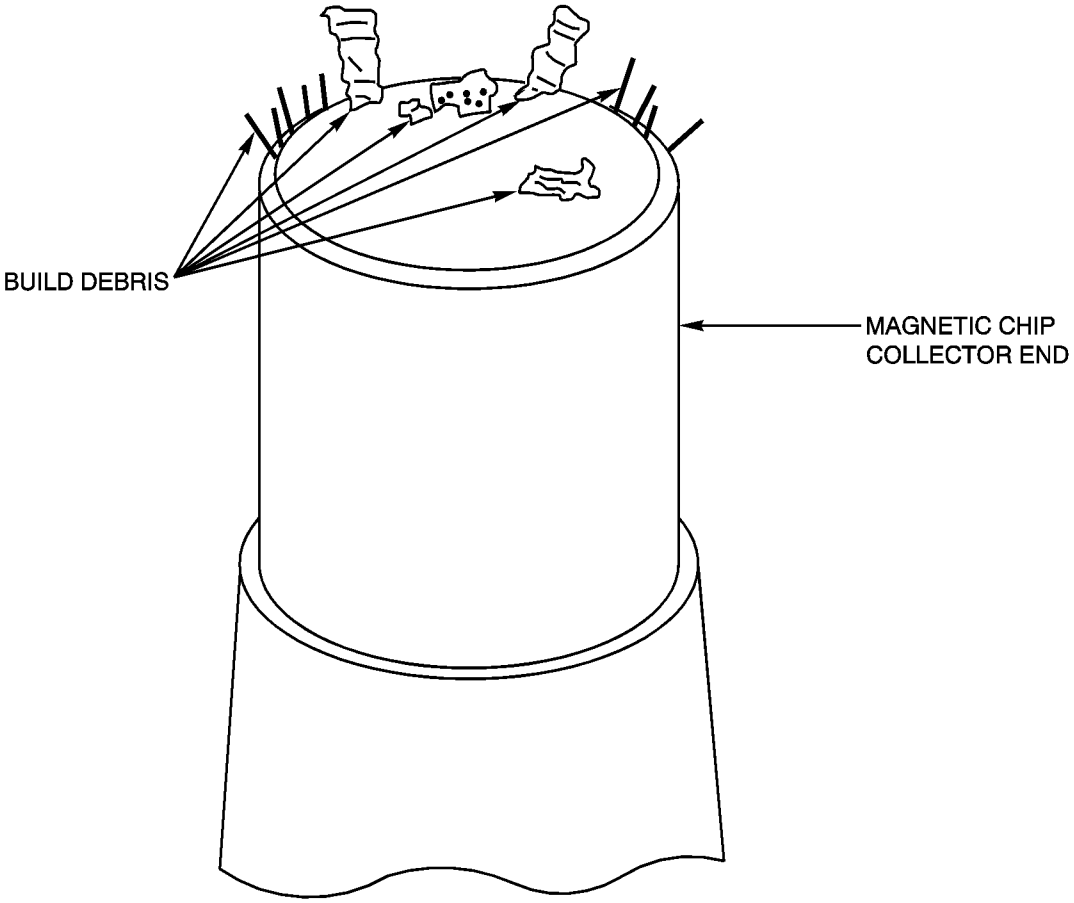
PW V

Main and Angle Gearbox Chip Collectors Locations
And Magnetic Plug Assembly
Figure 603



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PW V

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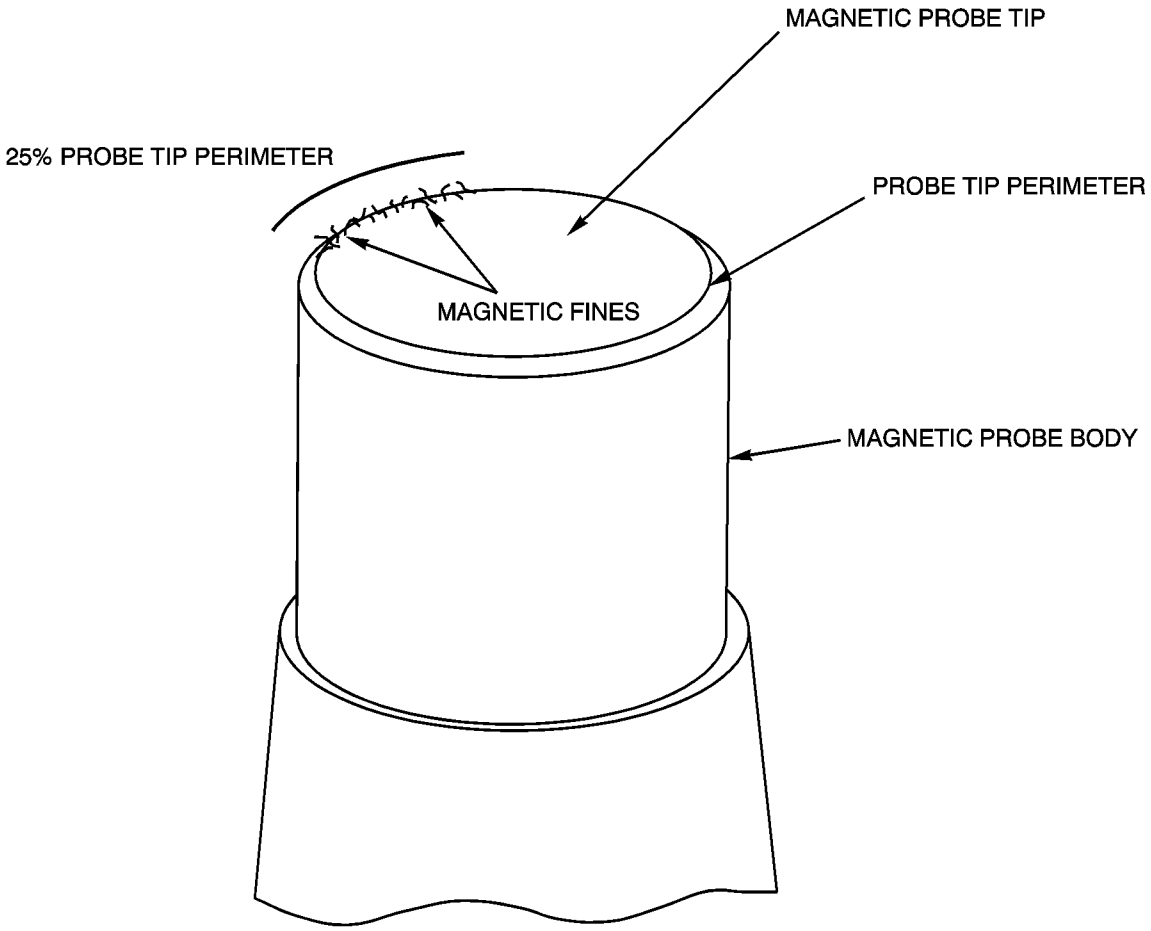
Magnetic Chip Collector and Examples of Build Debris
Figure 604



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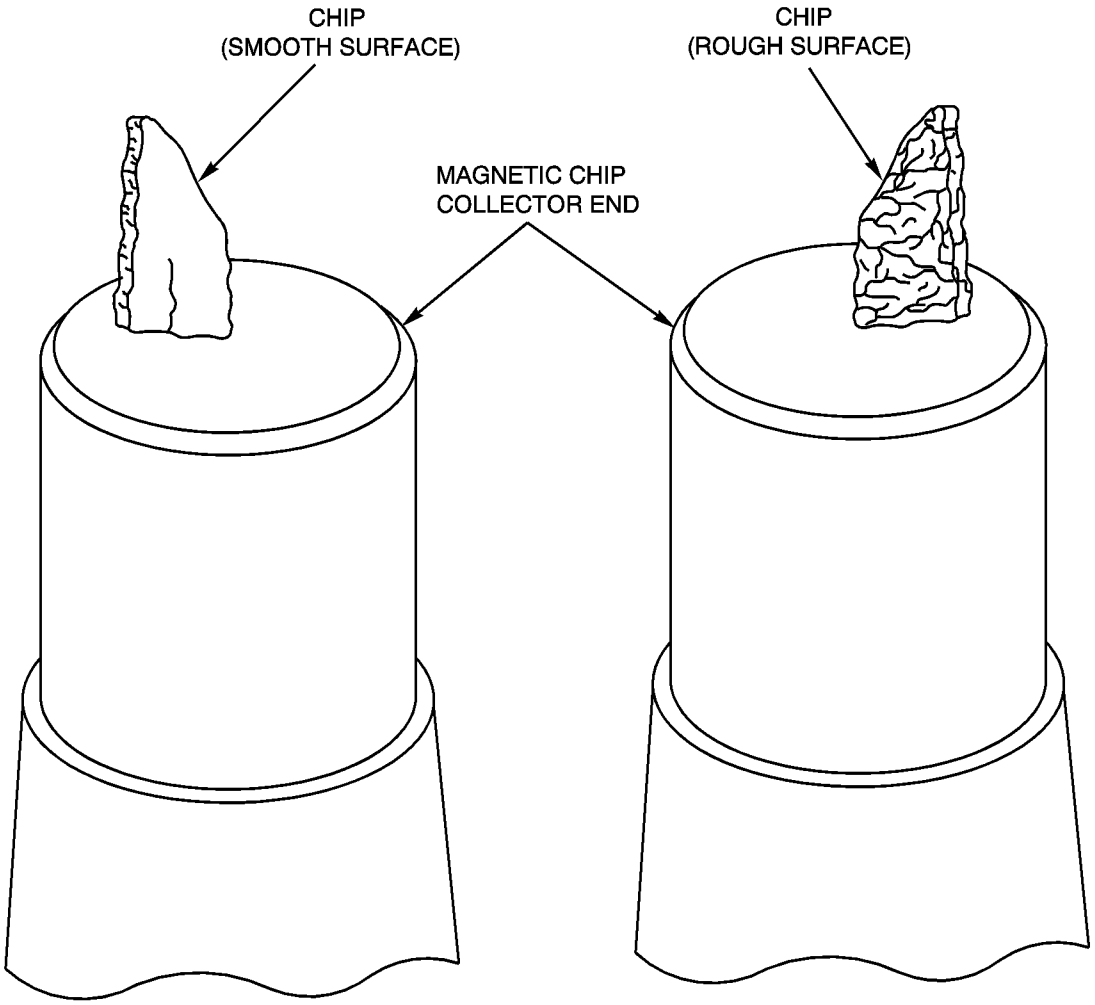
L-D2106 (0305)
PW V

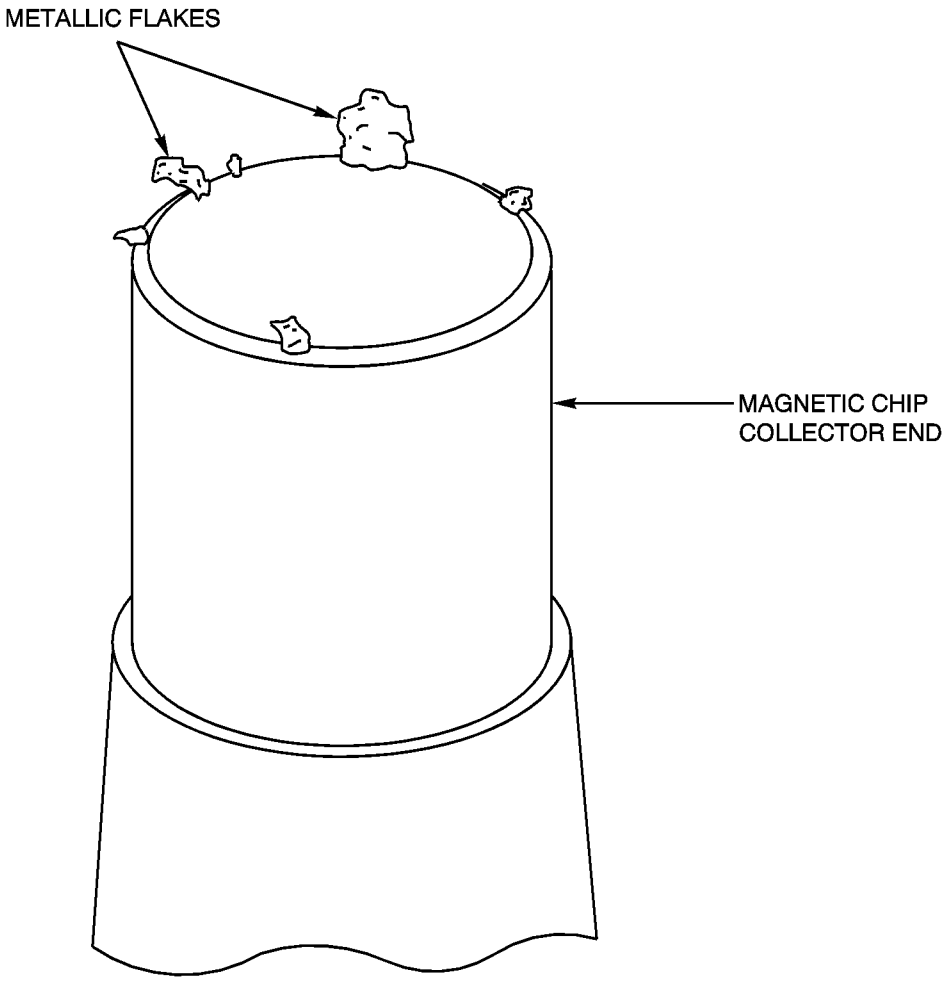
Magnetic Chip Collector and Examples of Magnetic Fines
Figure 605



L-H3012 (0306)
PW V

BM5 79 22 03 6 KLM0 01

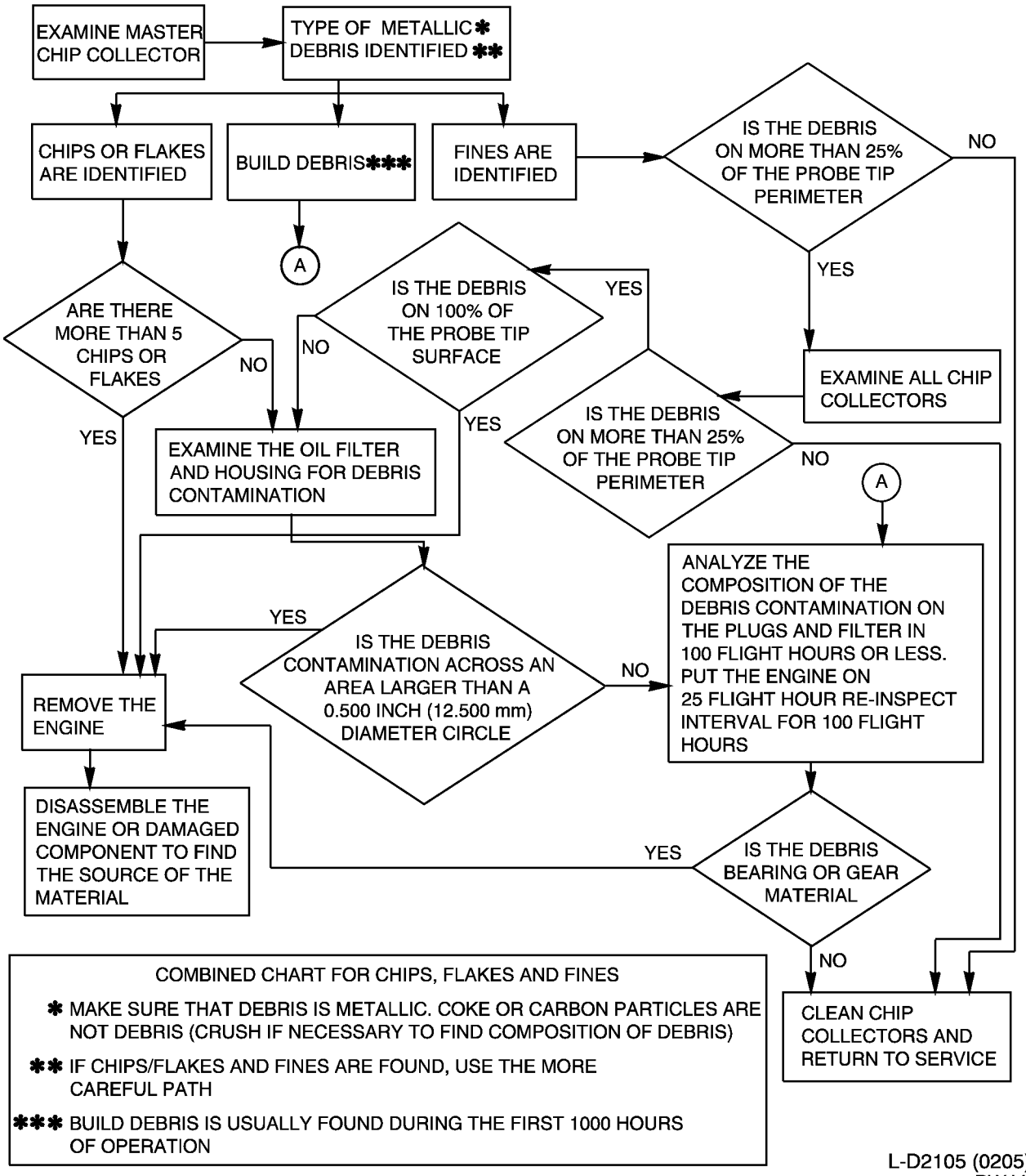
Magnetic Chip Collector and Examples of Chips
Figure 606



L-H3011 (0306)
PW V

BM5 79 22 03 6 KNM0 01

Magnetic Chip Collector and Examples of Metallic Flakes
Figure 607


EXAMINE MASTER CHIP COLLECTOR
TYPE OF METALLIC* DEBRIS IDENTIFIED **
CHIPS OR FLAKES ARE IDENTIFIED
BUILD DEBRIS***
FINES ARE IDENTIFIED
IS THE DEBRIS ON MORE THAN 25% OF THE PROBE TIP PERIMETER
NO
YES
A
ARE THERE MORE THAN 5 CHIPS OR FLAKES
NO
YES
IS THE DEBRIS ON 100% OF THE PROBE TIP SURFACE
NO
YES
EXAMINE ALL CHIP COLLECTORS
IS THE DEBRIS ON MORE THAN 25% OF THE PROBE TIP PERIMETER
NO
A
EXAMINE THE OIL FILTER AND HOUSING FOR DEBRIS CONTAMINATION
ANALYZE THE COMPOSITION OF THE DEBRIS CONTAMINATION ON THE PLUGS AND FILTER IN 100 FLIGHT HOURS OR LESS. PUT THE ENGINE ON 25 FLIGHT HOUR RE-INSPECT INTERVAL FOR 100 FLIGHT HOURS
YES
IS THE DEBRIS CONTAMINATION ACROSS AN AREA LARGER THAN A 0.500 INCH (12.500 mm) DIAMETER CIRCLE
NO
REMOVE THE ENGINE
DISASSEMBLE THE ENGINE OR DAMAGED COMPONENT TO FIND THE SOURCE OF THE MATERIAL
YES
IS THE DEBRIS BEARING OR GEAR MATERIAL
NO
CLEAN CHIP COLLECTORS AND RETURN TO SERVICE
COMBINED CHART FOR CHIPS, FLAKES AND FINES
* MAKE SURE THAT DEBRIS IS METALLIC. COKE OR CARBON PARTICLES ARE NOT DEBRIS (CRUSH IF NECESSARY TO FIND COMPOSITION OF DEBRIS)
** IF CHIPS/FLAKES AND FINES ARE FOUND, USE THE MORE CAREFUL PATH
*** BUILD DEBRIS IS USUALLY FOUND DURING THE FIRST 1000 HOURS OF OPERATION
L-D2105 (0205)
PW V
BM5 79 22 03 6 KPM0 06

Troubleshooting Chart for Magnetic Fines, Chips, and Flakes
Figure 608

R

BREATHER SUPPLY VENT SYSTEM - DESCRIPTION AND OPERATION

1. General

To ensure satisfactory lubrication throughout the flight envelope, engine oil pressure varies as function of N2 speed. To avoid oil leakage from the bearing chambers, an inward pressurization of the seal is created, using compressor stage air from location appropriate to each chamber.
This results in :
- some air being entrapped in the main scavenge oil flow
- some oil droplets escaping with the breather air.

It is necessary to separate the air from the oil, for both safety and oil consumption reasons.

2. Breather System

Breather air, resulting from air leakage past the knife-edge and carbon seals, is routed from the Nos. 1, 1.5, 2 and 3 bearing compartments to the external deoiler on the gearbox front face.
The No. 4 compartment has its breather air/scavenge oil returned to the tank via the scavenge pump for the No. 4 bearing. The entrained air is removed via the deaerator in the oil tank. The oil tank breathes through the gearbox to the deoiler.

3. Separation of the Air Mixed with the Oil

Air mixed with the oil is separated by a deaerator installed at the scavenge line outlet, i.e., within the oir tank itself.

4. Separation of Oil Droplets Suspended in Ambient Air

The breather system is vented overboard through an externally mounted centrifugal separator. The separator is located in its own housing, bolted to the main gearbox rear face. It is a brazed aluminium impeller with canted radial vanes, between which oil droplets are separated from the air by centrifugal action. Oil is collected through drain holes and returned to the gearbox by gravity. Cleaned air is then expelled to the outside of the nacelle.

DEOILER - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P03-001	Oils (Ref. 70-00-00)
C. Material No.P06-003	Lubricants (Ref. 70-00-00)
D.	Container 5 US Gallons (19 Liters)
E.	Packings
F.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
G.	Torque Wrench
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-65-01, P. Block 701	Main Gearbox

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open thrust reverser doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401, 402)
(1)Drain oil from main gearbox by removing lockwire, drain plug, and packing from insert (bushing) located in bottom front center of main gearbox. Discard packing.
NOTE : Catch oil in container with a capacity of approximately 5 U.S. gallons (19 liters).
(2)Remove two bolts securing main gearbox pressure tube assembly to gearbox below deoiler on front, left side of gearbox.
(3)Remove bolt and nut securing clamp on tube to bracket on flange of breather tube at top of deoiler.
(4)Remove clamps, bolts, and nuts securing spray shield to top connection. Remove spray shield.
(5)Remove lockwire and disconnect upper end of tube from tube tee and remove tube from engine. Discard packing.
(6)Remove the six bolts securing the No. 1, 1.5 and 2 bearing breather tube and No. 3 bearing breather tube to the two upper ports on deoiler. Remove bracket.
(7)Remove lockwire from upper ends of breather tubes and disconnect tubes at tube nuts located near top of fuel/oil cooler. Discard packings from deoiler ends of breather tubes.
(8)Loosen bolt as required securing tube clamps to brackets in order to reposition tubes away from deoiler.
(9)Remove bolts and washers securing deoiler housing to gearbox and remove deoiler housing. Discard packing.
(10)Install protective closures.

C. Installation (Ref. Fig. 401, 402)

NOTE : Before installation, you can clean seal face of main gearbox for coke or scoring (Ref. 72-65-01, P. Block 501).

(1)Remove protective closures.

(2)Lubricate new packing with Material No.P03-001, and install to groove in deoiler housing and install housing, aligning offset hole, to pad on left front side of gearbox adjacent to main oil filter and secure with washers and Material No.P03-001, lubricated bolts. TORQUE bolts to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN).

(3)Lubricate new packing with Material NO.P03-001, and install to groove on flanged ends of No. 1, 1.5 and 2 bearing breather tube and No. 3 bearing breather tube.

(4)Position flanged ends of tubes to ports on deoiler housing and secure with lubricated (Material No.P03-001) bolts and bracket positioned as shown in Figure (Ref. Fig. 402). TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(5)Lubricate threads of upper ends of breather tubes with Material No.P06-003, and attach tube nuts to adapters on mating tubes. TORQUE tube nut on No. 3 bearing breather tube to between 950 and 1050 lbf.in. (10.73 and 11.86 m.daN). TORQUE tube nut on No. 1, 1.5 and 2 bearing breather tube to between 675 and 750 lbf.in. (7.63 and 8.47 m.daN). Wirelock tube nuts.

(6)TORQUE clamp bolts to between 36 and 40 lbf. in. (0.41 and 0.45 m.daN).

(7)TORQUE bolts securing lower ends of tubes to deoiler to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(8)TORQUE No. 3 bearing breather tube top nut to between 675 and 750 lbf.in. (7.63 and 8.47 m.daN) and wirelock.

(9)TORQUE No. 1, 1.5 and 2 bearing breather tube top nut to between 1150 and 1300 lbf.in. (12.99 and 14.69 m.daN). and wirelock.

(10)Lubricate new packing with Material No.P03-001, and install to groove on flanged end of main gearbox pressure tube assembly and install tube to boss on gearbox below deoiler housing and secure with lubricated (Material No.P03-001) bolts. TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(11)Lubricate threads on tee with Material No.P06-003, and install tube nut on main bearing pressure tube assembly to tee. TORQUE tube nut to between 340 and 375 lbf.in. (3.84 and 4.24 m.daN). Wirelock tube nut.

(12)Secure clamp on main bearing pressure tube to bracket on flange of breather tube on deoiler housing with lubricated (Material No.P03-001) screw and nut. TORQUE nut to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(13)TORQUE bolts securing tube to gearbox to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(14)TORQUE tube nut to tee to between 340 and 375 lbf.in. (3.84 and 4.24 m.daN) and wirelock.

(15)Position spray shield to inboard side of tee and secure in place with bolts, threads lubricated with Material No.P03-001 and hose clamp.

(16)TORQUE bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN) and hose clamp to between 40 and 45 lbf.in. (0.45 and 0.51 m.daN).

(17)Lubricate new packing with Material No.P03-001, and position on gearbox oil drain plug. Lubricate threads of drain plug with Material No.P03-001

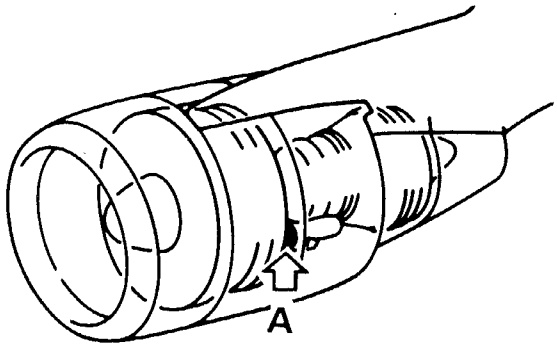
and install drain plug to insert (bushing) located in bottom front center of main gearbox. TORQUE plug, while holding insert (bushing) to prevent turning, to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Wirelock plug.

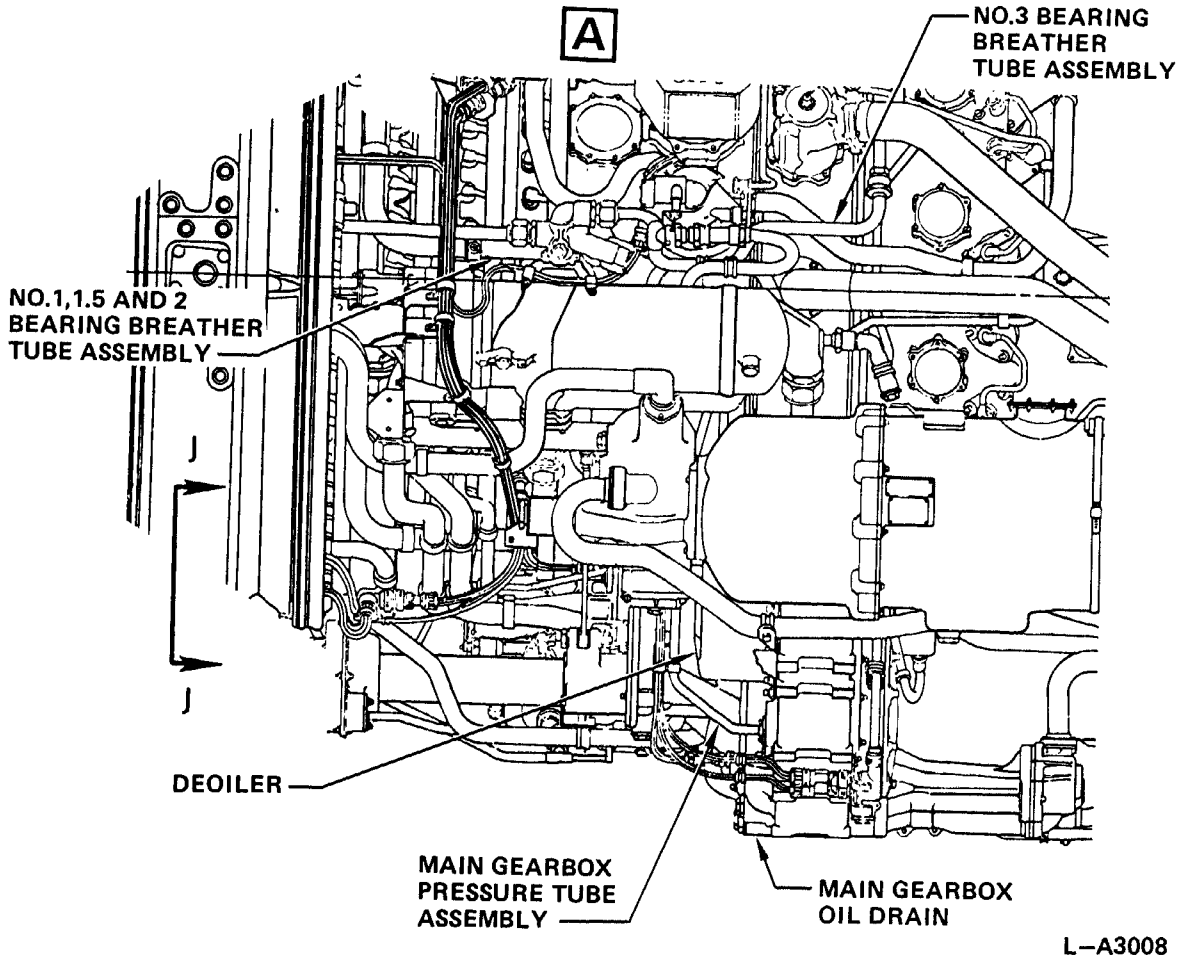
D. Close-Up

(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2) Close thrust reverser doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

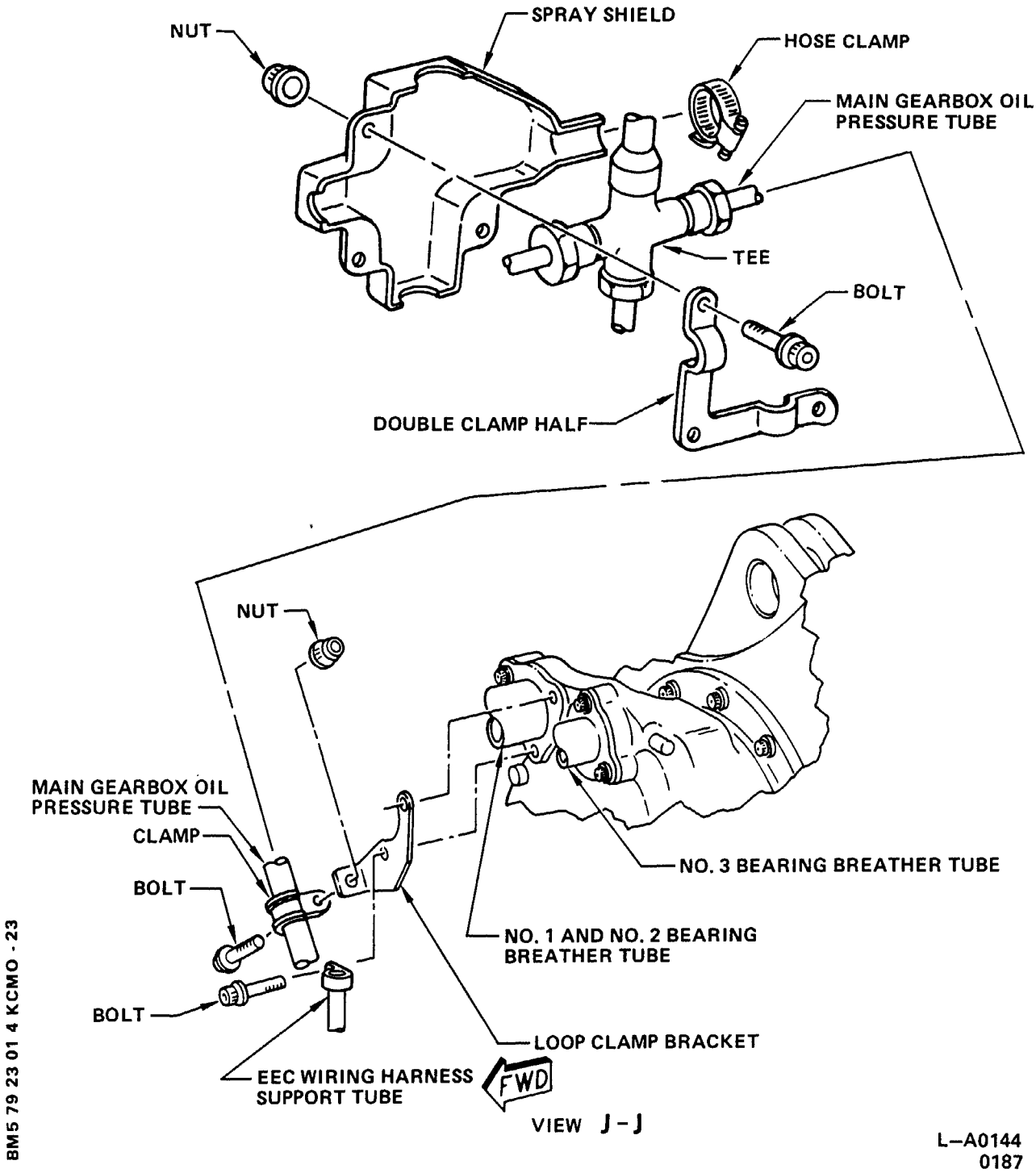
(3) Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).





BM5 79 23 01 4 KAMO - 23

Gearbox Mounted Deoiler
Figure 401



Deoiler Clamp Bracket Installation
Figure 402

DEOILER VENT DUCT - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Torque Wrench
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

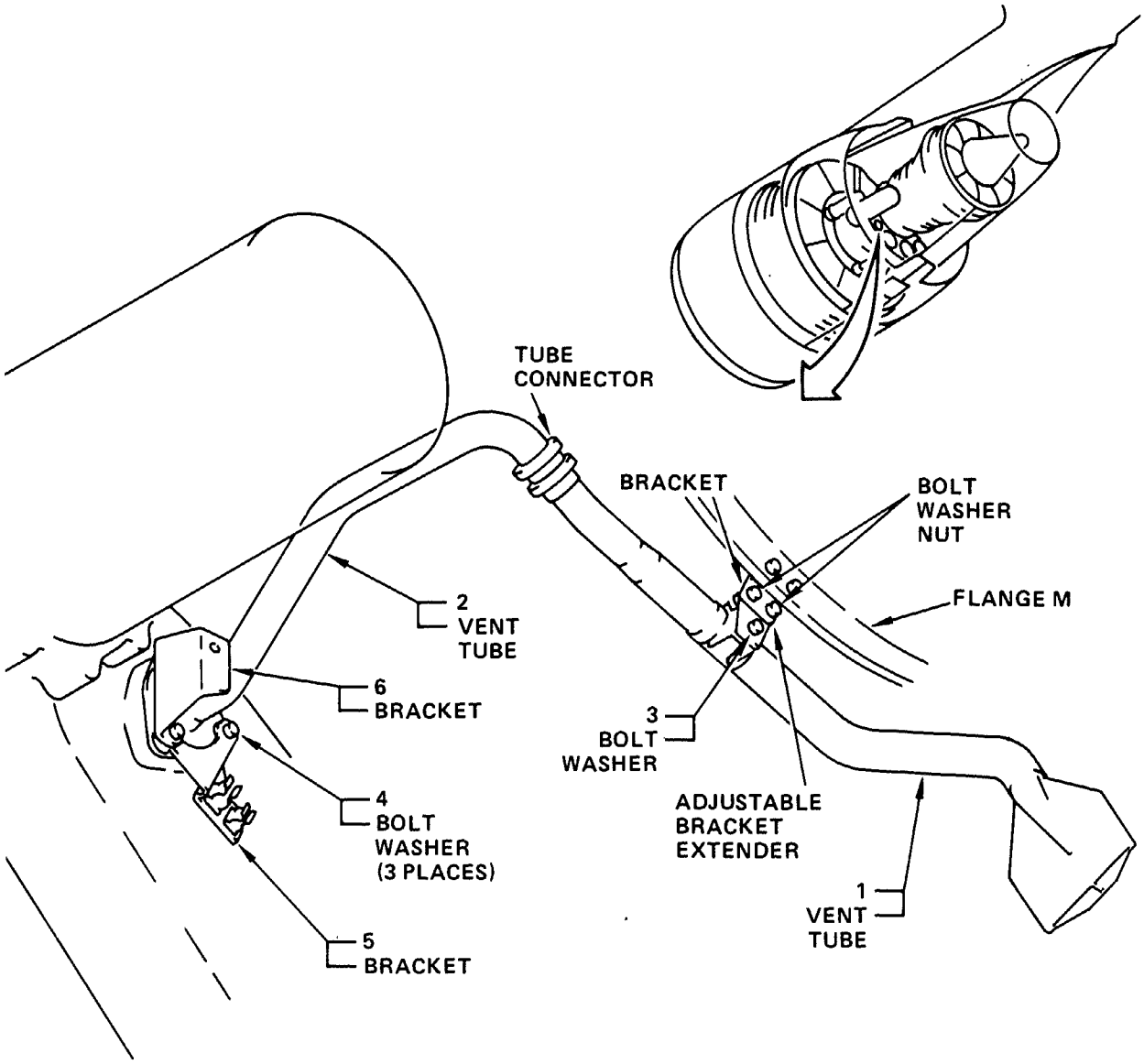
2. Procedure

A. Job Set-Up
(1) Open, safety and tag the appropriate circuit breakers, and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)
(1) Disconnect vent duct (1) from vent duct (2).
(2) Remove bolt (3) and washer from adjustable bracket extender and remove vent duct (1).
(3) Remove three bolts (4) attaching bracket (5), bracket (6), and vent duct (2) to main gearbox.

C. Installation (Ref. Fig. 401)
(1) Position vent duct (2), bracket (5), and bracket (6) on main gearbox and install three bolts (4) and washers. Do not fully torque at this time.
(2) Fasten vent duct (1) to vent duct (2) with duct connector. Do not torque fully at this time.
(3) Install bolt (3) and washer attaching vent duct (1) to adjustable bracket extender. Do not torque fully at this time.
(4) Check for correct alignment of vent ducts (1) and (2) and ensure that vent ducts are not subject to preloading.
(5) TORQUE three bolts (4) to between 65 and 75 lbf.in. (0.73 - 0.84 m.daN).
(6) TORQUE vent duct connector to between 950 and 1050 lbf.in. (10.7 - 11.8 m.daN).
(7) TORQUE bolt (3) to between 65 and 75 lbf.in. (0.73 - 0.84 m.daN).
(8) Loosen two bolts on bracket extender to allow adjustment of vent duct assembly. Align vent duct assembly with centerline of thrust reverser doors. TORQUE two bolts to between 65 and 75 lbf.in. (0.73 - 0.84 m.daN).

D. Close-Up
(1) Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags, and close circuit breakers.



BM5 79 23 03 4 KAMO - 20

Deoiler Vent Duct
Figure 401

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

NO. 3 BEARING BREATHER AND RESTRICTOR VALVE - REMOVAL/INSTALLATION

NOTE : This procedure is available on aircraft equipped with Phase 3 or hybrid configured engines and in Pre SB PW4ENG 75-144 configuration.

NOTE : Only 3 hybrid configurations (1C, 1E or 3A) are allowed between Phase 1 and Phase 3 engine configuration.

1. Equipment and Materials

ITEM	DESIGNATION
A.	Lockwire
B.	Packing
C. Material No.P03-001	Oils (Ref. 70-00-00)
D. Material No.P06-021	Lubricants (Ref. 70-00-00)
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure (Ref. Fig. 401)

A. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open thrust reverser doors (Ref. 71-13-00, P. Block 301).

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

B. Removal

(a)Remove the lockwire from the tube nut on the No. 3 bearing breather and restrictor valve air supply tube (AP39).

(b)Disconnect the tube nut from the restrictor valve.

(c)Remove the three bolts that attach the No. 3 bearing breather tube (LB04) to the restrictor valve. Remove the seal face from between the tube and the valve.

(d)Remove the three bolts that attach the valve to the deoiler on the gearbox.

(e)Remove the restrictor valve from the gearbox.
Discard the packing from the valve.

(f)Install protection covers to all openings.

C. Installation

(a)Remove the protection covers from the openings.

(b)Lubricate the packing with Material No.P03-001 and install the packing

to the groove on the elbow of the restrictor valve.

(c)Install the restrictor valve to the three-hole mount pad on the deoiler on the front right side of the gearbox. Attach the valve with bolts, threads lubricated with Material No.P03-001 and tighten by hand.

(d)Install the face seal between the upper three hole-pad on the restrictor valve and the No. 3 bearing breather tube (LB04). Attach the tube to the valve with bolts, threads lubricated with Material No.P03-001 and tighten by hand.

(e)Lubricate the tube nut of the No. 3 bearing breather and restrictor valve, air supply tube (AP39) with Material No.P06-021. Connect the tube to the restrictor valve and tighten by hand.

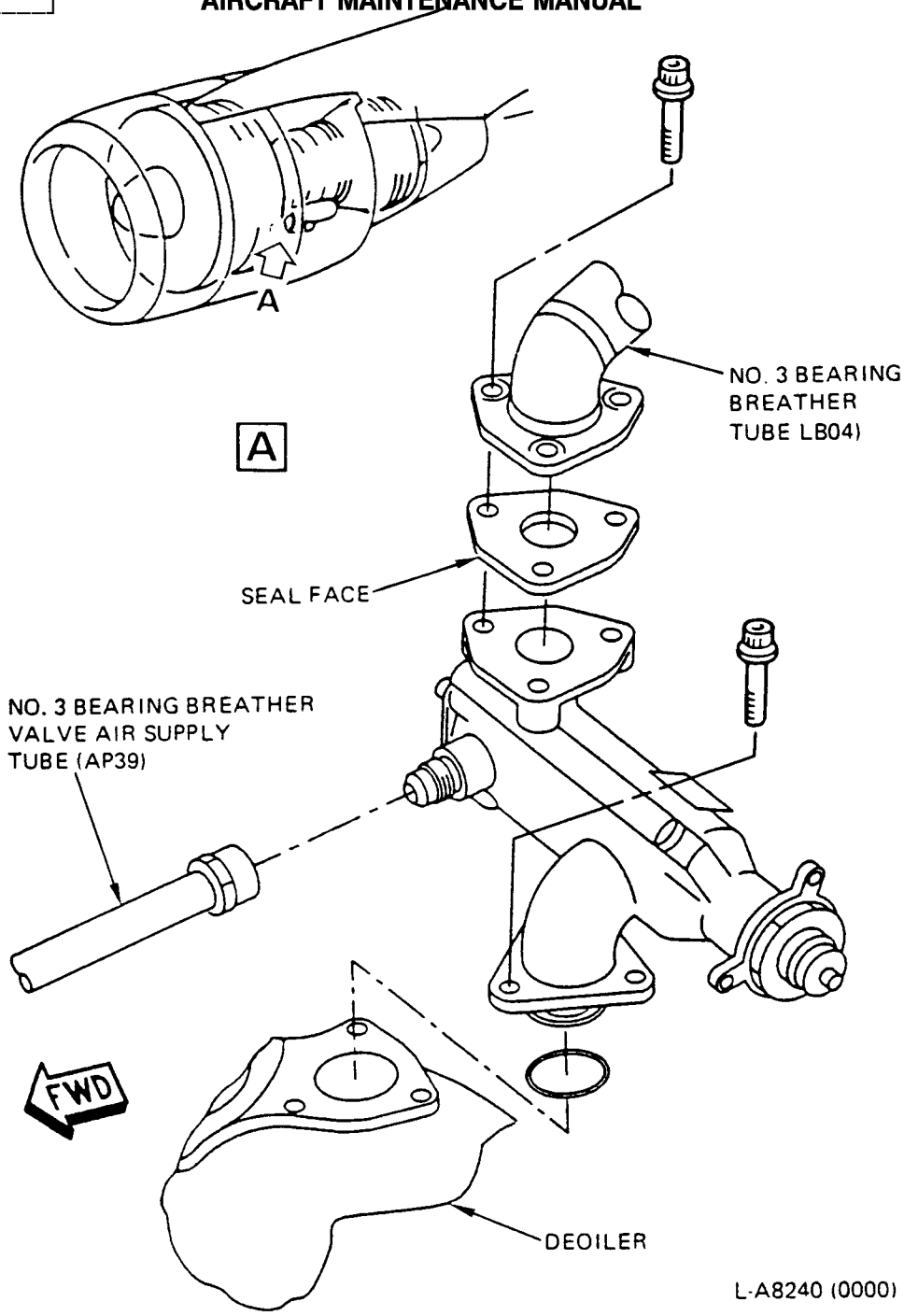
(f)TORQUE the bolts that attach the restrictor valve to the deoiler to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(g)TORQUE the bolts that attach the No. 3 bearing breather tube (LB04) to the restrictor valve to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(h)Torque the tube nut to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN) and wirelock the tube nut.

D. Close-Up

(1)Close thrust reverser doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



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No. 3 Bearing Breather and Restrictor Valve
Figure 401

INDICATING - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)

The following oil system parameters and/or warnings are displayed to the crew for monitoring purpose :

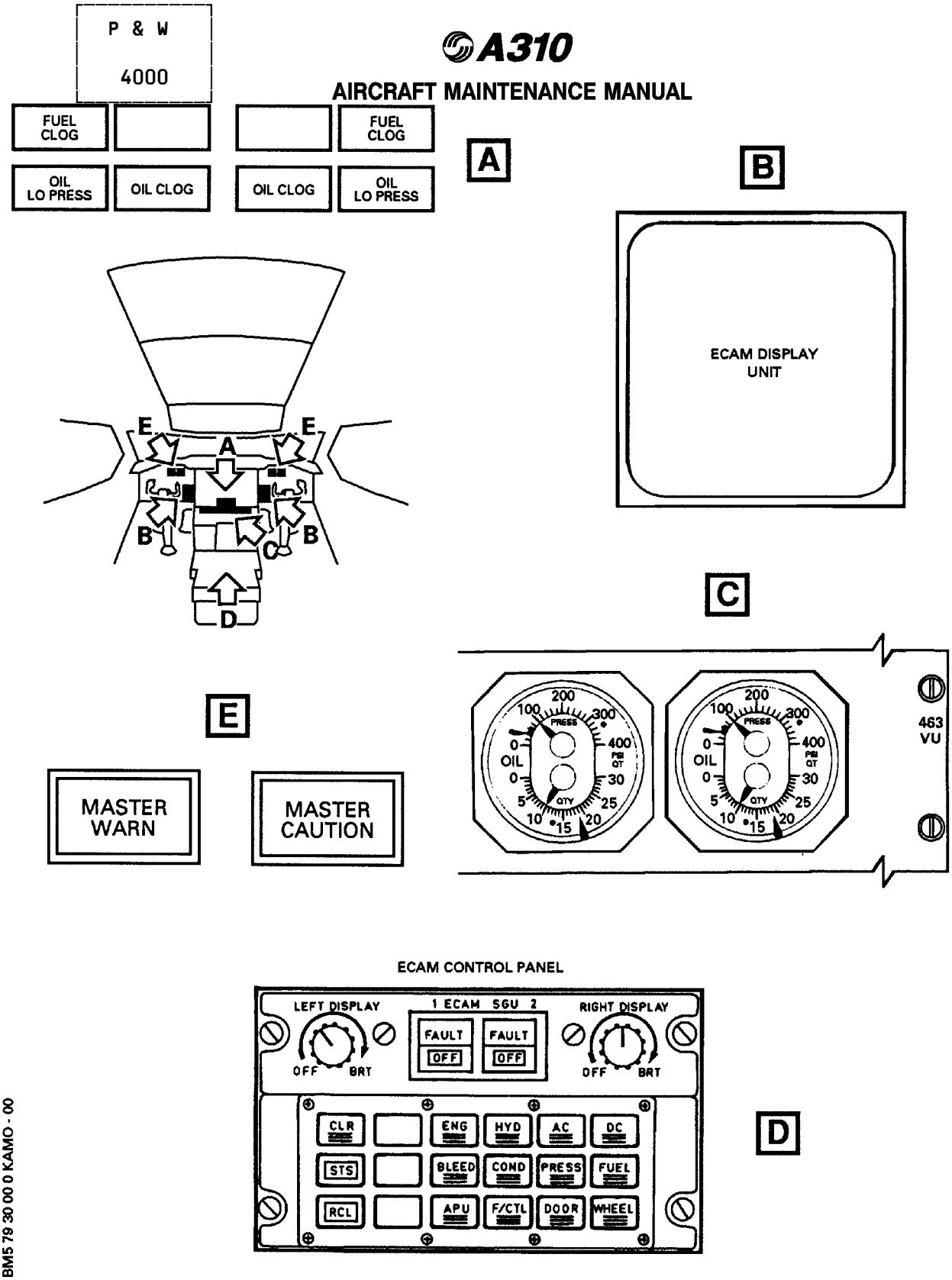
- Oil quantity
- Oil pressure
- Oil temperature
- Oil delta temperature between main oil temperature and No. 3 bearing oil outlet temperature
- Low oil pressure warning (red color)
- Oil filter clogging (amber color)

The oil quantity and oil pressure parameters are displayed on combined indicator in addition to the display on ECAM system.

During the following flight phases, the four first indications are automatically displayed on the ECAM display units, unless another system has been automatically or manually selected. (Ref. Fig. 002).

- Engine start
- Take-off (until slat retraction)
- Climb
- After parking brakes have been applied (until engines shut down)
- At engine failure.

These parameters will also be displayed each time the crew manually select the engine message.



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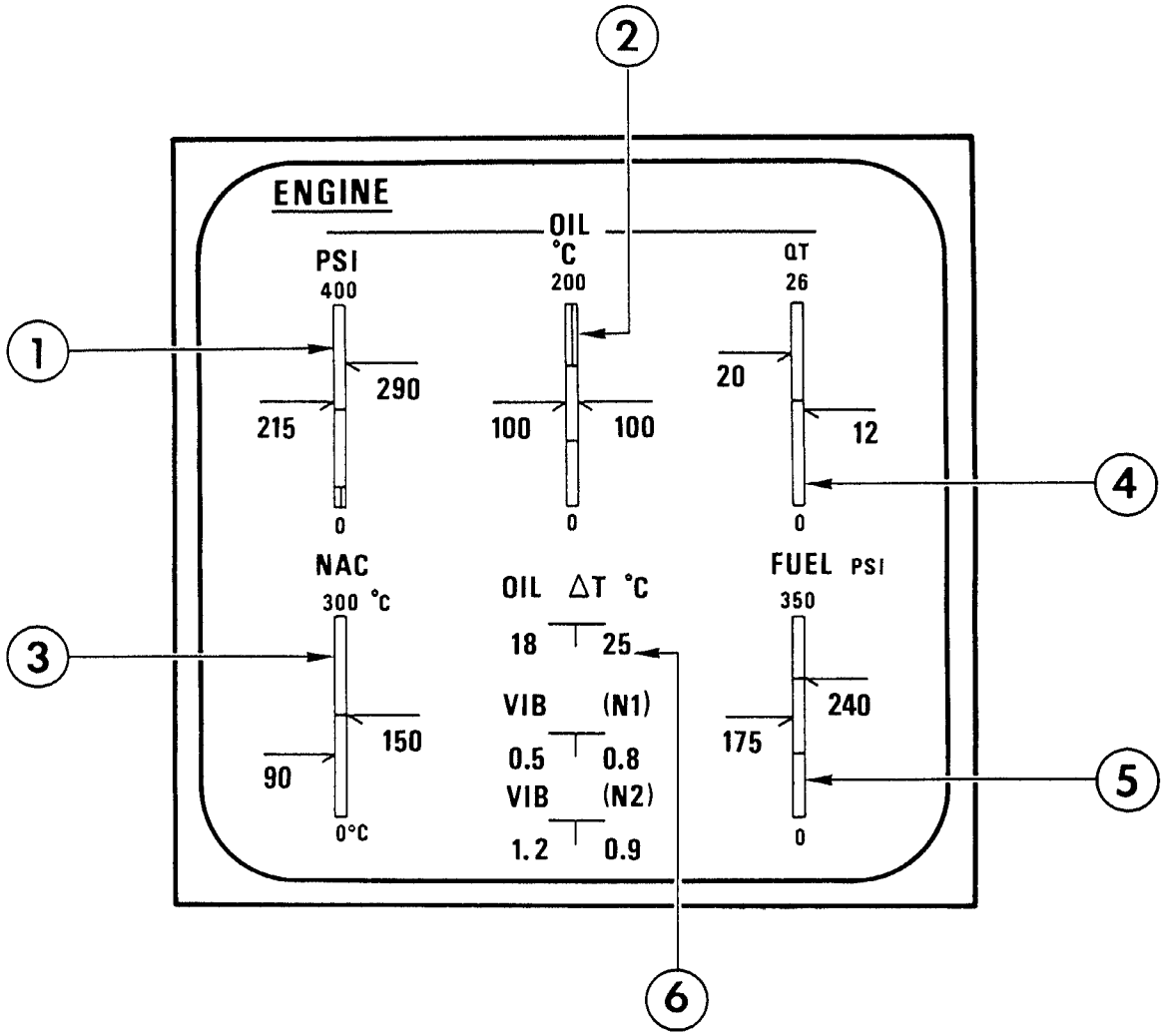
Component Location - Indications
Figure 001



1 – OIL PRESSURE
– FLASHES (G) WHEN 70PSI < P ≤ 75 PSI
– (R) WHEN P ≤ 70PSI

2 – OIL TEMPERATURE
– FLASHES (G) WHEN 163°C ≤ T ≤ 177°C
– (A) WHEN T ≥ 177°C OR MORE THAN 20 MN ABOVE 163°C

3 – NACELLE TEMPERATURE (G)
FLASHES WHEN ≥ 200°C

4 – OIL QUANTITY (G)
FLASHES WHEN QUANTITY ≤ 4 QTS

5 – FUEL PRESSURE
NO ADVISORY

6 – OIL ΔT (G)
FLASHES WHEN ΔT ≥ 44°C

BM5 79 30 00 0 KCM0 01

ENGINE Page - Right ECAM Display Unit
Figure 002

R

OIL QUANTITY INDICATION - DESCRIPTION AND OPERATION

1. General

A. Oil Tank Sight Gage (Ref. Fig. 001)

(1)Description

(a)The oil level indicator (oil tank right gage) is on the top of the oil tank at the rear.

(b)It shows the approximate oil quantity with a prism.

(2)Operation

(a)To know the oil quantity with a type 1 indicator :

1 Point a light at the prism.

2 If the prism is dark, the oil quantity is satisfactory.

3 If the prism is light, the oil is more than one quart (0.94 l.) low.

(b)To know the oil quantity with a type 2 indicator :

1 If you see the letters "OK" in the prism, the oil quantity is satisfactory.

2 If you do not see the letters "OK" in the prism, the oil is more than one quart (0.94 l.) low.

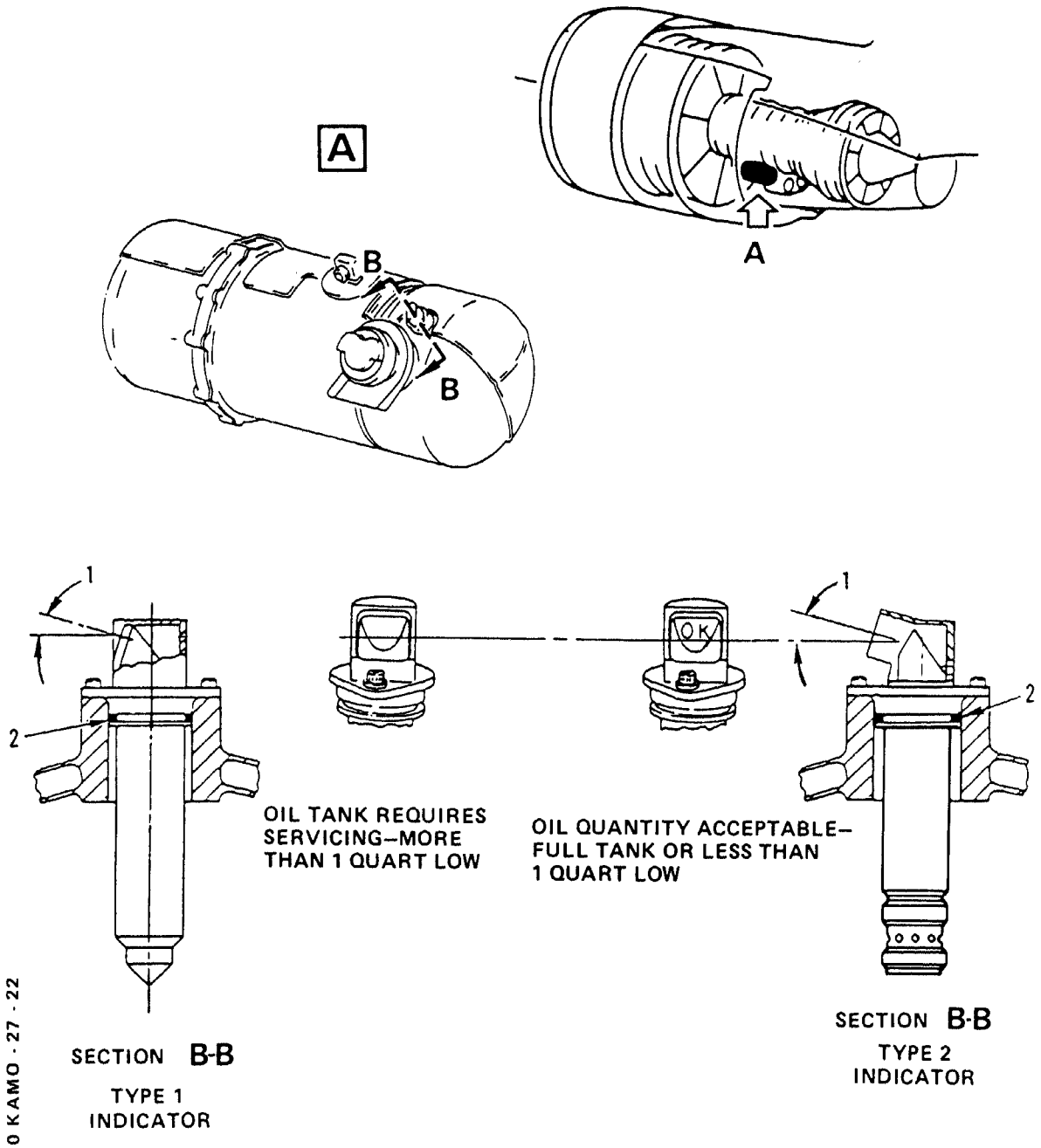
B. Oil Quantity Transmitter (Ref. Fig. 001)

The transmitter is installed in the oil tank.
It is power supplied through the oil quantity indicator. An output voltage proportional to oil quantity is returned for flight compartment indication.
The transmitter has a tube reaching the full height of tank interior where the oil surface can exist. A float follows the oil surface level causing a change in circuit resistance as it moves. The output voltage thereby varies with the oil level in the tank.

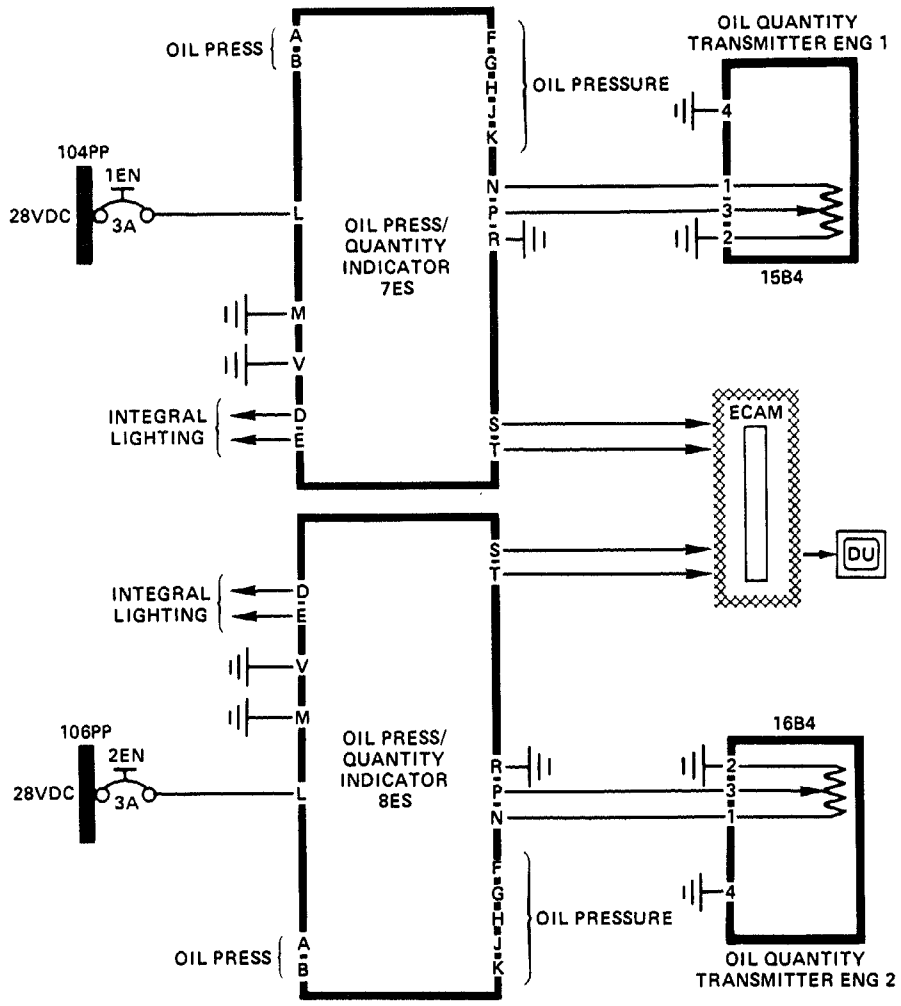
C. Oil Quantity Indications (Ref. Fig. 002)

The signal from the transmitter is sent to the analog indicator 7ES (8ES) (graduated from 0 to 30 Qts, effective range 0 to 26 Qts, accuracy ± 2 %) supplied with 28 volts from normal busbar 104PP (106PP) via circuit breaker 1EN (2EN).
This indicator has a peripheral index enabling oil consumption to be checked. A recopy of the indicator is sent to the system data analog converter (SDAC) which converts the analog signal into a digital form and displays it on the ECAM display unit via the symbol generator unit (SGU).
If the ENGINE page is displayed, this signal gives the oil quantity on a vertical scale graduated from 0 to 26 Qts. The indicator is located below the main instrument panel 463VU. This indicator features a test switch (BITE) located on the back and enabling oil quantity measurement channel to be tested.
When the BITE is selected by turning (in the arrow direction) and maintaining the BITE screw, the oil quantity pointer goes to the "blue dot" mark (13 QTs).
The indicator returns to initial configuration when the BITE screw is released.
Below 4 Qts an advisory (flashing green) is displayed on ECAM display unit.

2. Component Location



Oil Tank Sight Gage Description
Figure 001

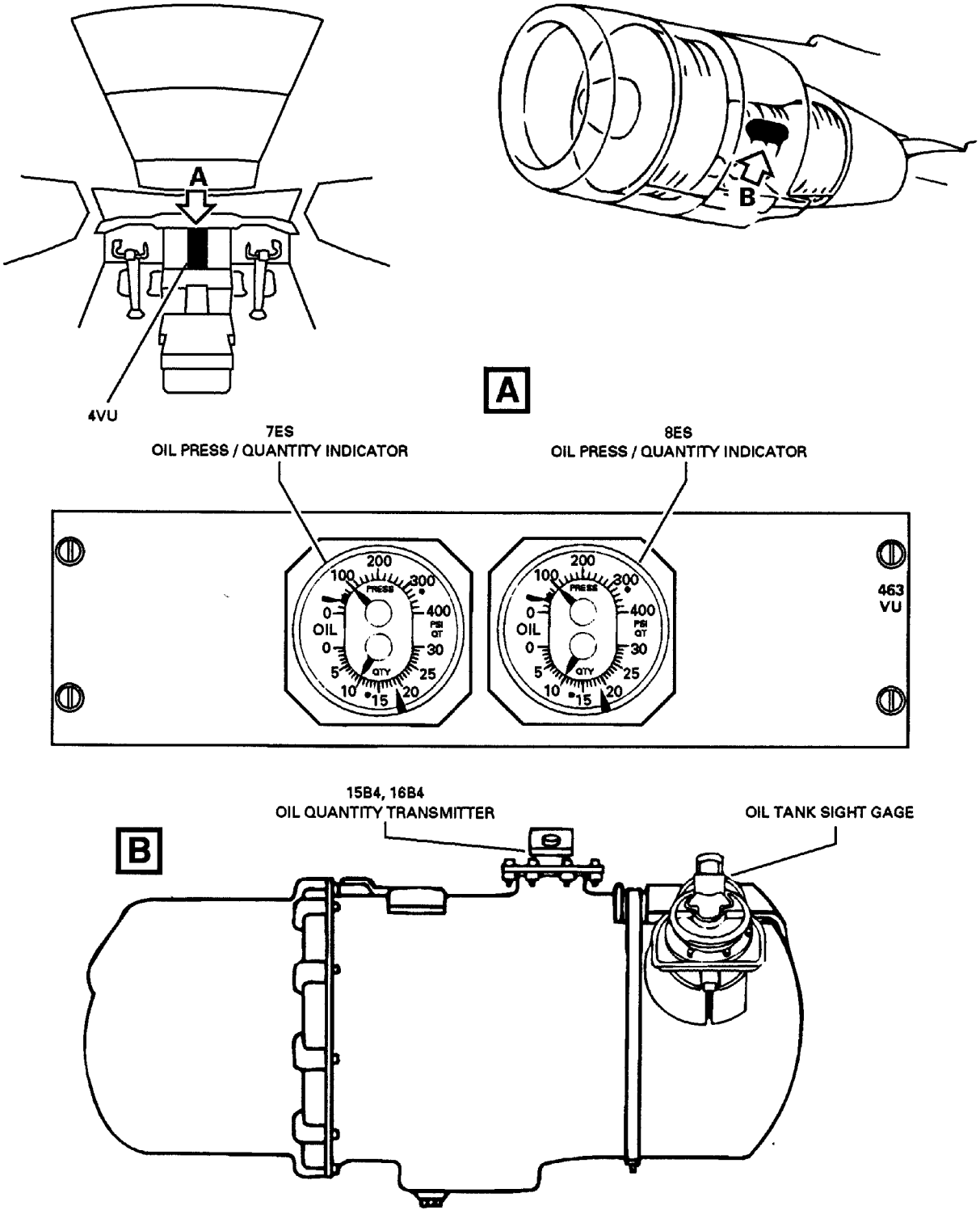


BM5 79 31 00 0 KCM0 01

Oil Quantity Indication - Schematic
Figure 002

(Ref. Fig. 003)

FIN	FUNCTIONAL DESIGNATION	PANEL	ZONE	ACCESS DOOR	ATA REF.
	SIGHT GAGE - OIL TANK		451	435AL	79-31-01
			461	445AL	79-31-01
15B4	TRANSMITTER - OIL QUANTITY		451	435AL	79-31-11
16B4	TRANSMITTER - OIL QUANTITY		461	445AL	79-31-11
7ES	QUANTITY INDICATOR - OIL PRESS	463VU	211		79-31-00
8ES	QUANTITY INDICATOR - OIL PRESS	463VU	212		79-31-00



BM5 79 31 00 0 KALO - 00

Oil Quantity Indication - Component Location
Figure 003

OIL QUANTITY INDICATING - ADJUSTMENT/TEST

1. Reason

This test procedure dealing with engine oil quantity indicating system, is performed by draining oil tank and adding known quantities of oil for comparison of indications.

2. Equipment and Materials

ITEM	DESIGNATION
A. Material No.P03-001	Oils (Ref. 70-00-00)
B.	Circuit Breaker Safety Clips
Referenced Procedures	
- 24-41-00, P. Block 301	AC External Power Control
- 71-13-00, P. Block 301	Cowl Doors
- 12-13-79, P. Block 1	Replenishing Oil - Engines
- 79-11-00, P. Block 401	Oil Tank
- 31-51-00, P. Block 1	ECAM System

3. Procedure

A. Job Set-Up

(1) Open safety and tag appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2) Make certain that ENGINES/OIL/ENG1/QTY (1EN) and ENGINES/OIL/ENG2/QTY (2EN) circuit breakers are closed.
(3) Energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).
(4) Make certain that electronics racks ventilation is correct.
(5) Make certain that ECAM system is operating (Ref. 31-51-00, P. Block 1)

B. Test

(1) Open ENGINES/OIL/ENG1/QTY (1EN) and ENGINES/OIL/ENG2/QTY (2EN) circuit breakers and check that pointers drop to low position.
(2) Drain oil from tank (Ref. 79-11-00, P. Block 401).
(3) Remove oil tank filler cap (Ref. 12-13-79, P. Block 1).
(4) Close ENGINES/OIL/ENG1/QTY (1EN) and ENGINES/OIL/ENG2/QTY (2EN) circuit breakers
(5) Add 9 QTs in the tank (Material No.P03-001).
(6) Check that on OIL QTY indicator, the quantity displayed is zero. Press ENG1(2) pushbutton switch on the ECAM CONTROL PANEL 11VU and check that on the ECAM display unit, the quantity displayed on the ENGINE page is zero.
NOTE : For all indications, compare the indicator and the ECAM system displays.
(7) Add 5 QTs oil in the tank : the indicators must read 5 QTs.
(8) Add 15 QTs oil in the tank : the indicators must read 20 QTs.
(9) Add 6 QTs oil in the tank : the indicators must read 26 QTs.
(10) Open ENGINES/OIL/ENG1/QTY (1EN) and ENGINES/OIL/ENG2/QTY (2EN) circuit breakers and check that pointers drop to low position
(11) Install engine oil tanks gravity filler cap

(12)On ECAM CONTROL PANEL, press CLR pushbutton switch.

C. Close-Up

(1)Remove safety clips and tags and close circuit breakers and close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(2)De-energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).

(3)Close ENGINES/OIL/ENG1/QTY (1EN) and ENGINES/OIL/ENG2/QTY (2EN) circuit breakers.

OIL TANK SIGHT GAGE - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P03-001	Oils (Ref. 70-00-00)
C.	Corrosion Resistant Steel Lockwire (AS 3214-02) (Ref. 70-00-00)
D.	Packing
E.	Torque Wrench
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

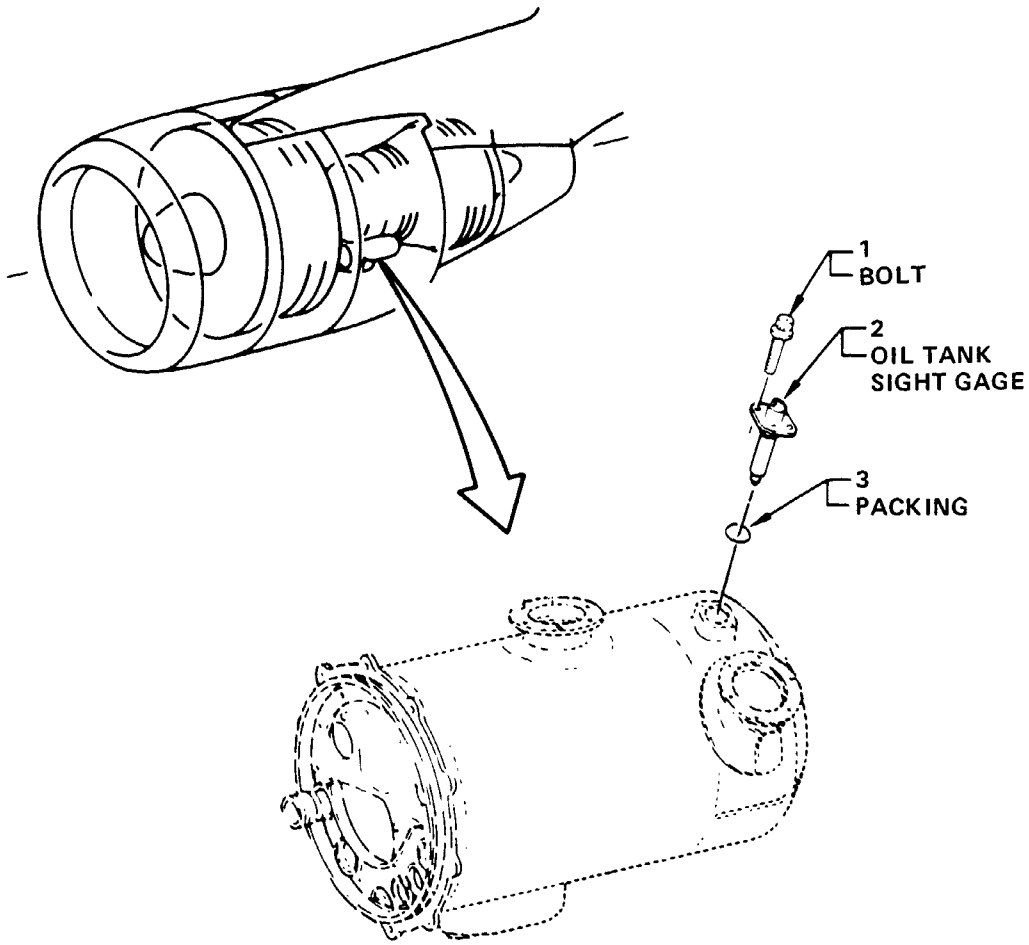
2. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)
(1)Remove lockwire and bolts (1).
(2)Remove the oil tank sight gage (2).
(3)Remove and discard the packing (3).
(4)To protect the hole, install a cover on the hole.

C. Installation (Ref. Fig. 401)
(1)Remove the cover from the oil tank hole.
(2)Apply Material No. P03-001 to two bolts (1) and a packing (3).
(3)Install the packing on the sight gage (2).
(4)Attach the sight gage (2) to the oil tank with the two bolts (1). TORQUE the bolts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN) and wirelock.

D. Close-Up
(1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.



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Oil Tank Sight Gage
Figure 401

OIL QUANTITY TRANSMITTER - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Protective Covers
C.	Packing
D.	Torque Wrench 70 lbf.in. (0.79 m.daN)
E.	Soft Jawed Pliers - TG-69
F.	Strap Wrench - TG-70
G. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENG1/OIL QTY	1EN	336/Q68
133VU	ENG2/OIL QTY	2EN	336/Q73

(2)Open, safety and tag the appropriate circuit breakers and open the fan cowl and thrust reverser doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)

(1)Disconnect electrical connector DT584 (8) from oil quantity transmitter as follows :

(a)Use TG-69 soft jawed pliers or TG-70 strap wrench to loosen connector from receptacle.

(b)Put protective covers on connector and receptacle.

WARNING : WHEN PERFORMING MAINTENANCE ON AN ENGINE THAT HAS BEEN RECENTLY USED OR RUN, EXERCISE CAUTION WHEN DISCONNECTING OIL LINES, AS HOT ENGINE OIL CAN CAUSE SERIOUS INJURY TO EYES OR SEVERE BURNS TO PERSONNEL.

(2)Remove six attachment bolts (1), washers (2) and nuts (6).

(3)Remove oil quantity transmitter (4), shroud assembly (3) and heatshield bracket (7) (Post SB PW4ENG 79-74) from engine oil tank.

(4)Put a temporary protective cover over oil tank opening.

(4)Remove packing (5) from oil quantity transmitter (4) and discard.

C. Installation (Ref. Fig. 401)

(1)Remove temporary protective cover from engine oil tank.

(2)Lubricate packing (5) with Material No.P03-001 and position on oil quantity transmitter (4).

(3)Install transmitter (4) in engine oil tank and align electrical

receptacle to face directly outward (90 degrees from engine center line).

(4)Place shroud assembly (3) over oil quantity transmitter (4) and align the opening to show electrical receptacle.

(5)Lubricate six bolts (1) threads with Material No.P03-001. Put heatshield bracket (7) (Post SB PW4ENG 79-74) under engine oil tank flange. Install six bolts (1), washers (2), and nuts (6) fingertight through shroud assembly (3), oil quantity transmitter and heatshield bracket (7) (Post SB PW4ENG 79-74).

(6)Torque six bolts (1) to between 75 and 85 lbf.in. (0.84 and 0.96 m.daN).

(7)Connect electrical connector DT584 (8) to receptacle as follows :

(a)Remove protective covers from connector and receptacle.

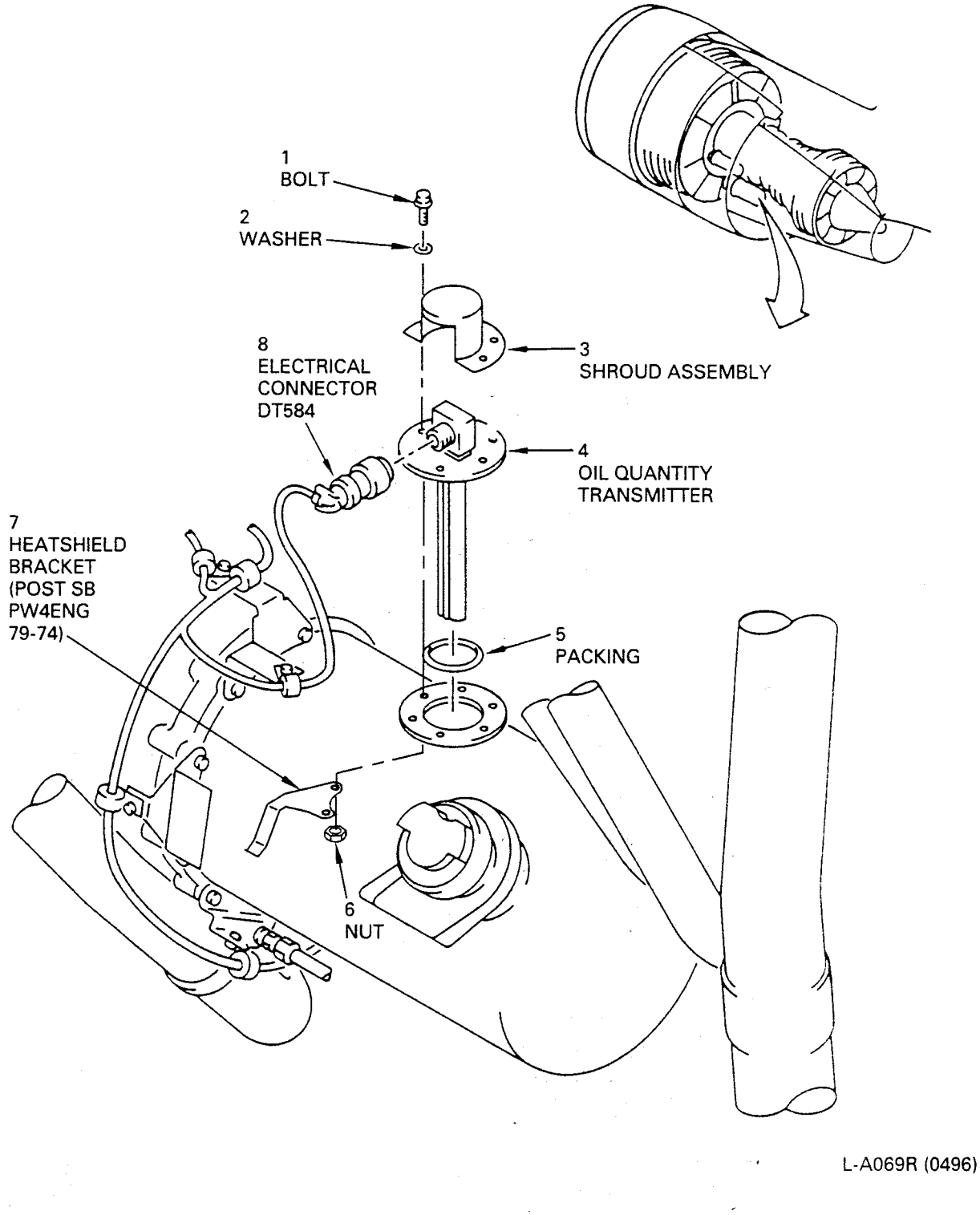
(b)Use TG-69 soft jawed pliers or TG-70 strap wrench and tighten connector against receptacle.

(c)Tighten connector until pliers or strap wrench slip on connector ring.

D. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.



Oil Quantity Transmitter
Figure 401

OIL TEMPERATURE INDICATING - DESCRIPTION AND OPERATION

1. Oil Temperature Indicating

A. General (Ref. Fig. 001, 002)

A tapping located on the forward face of the gearbox enables installation of an immersed resistance probe.
The probe resistance varies linearly with temperature. This signal is used by the SDAC and the SGU to generate a digital signal displayed on the ECAM display unit. The normal operating temperature should be below 163° C for continuous engine operation. However, an oil temperature between 163° C and 177° C is acceptable for less than 20 minutes when in transient conditions (particularly in the case of thrust reduction for descent, where the fuel flow, and hence, heat exchange rate, is reduced).
Between 163° C and 177° C an advisory (flashing green) is displayed on ECAM display unit. If this advisory remains on more than 20 minutes or when the temperature reaches 177° C, a warning (amber) with an associated procedure to shut down the engine are displayed on the ECAM display unit. The MASTER CAUTION light comes on and a single chime sounds.

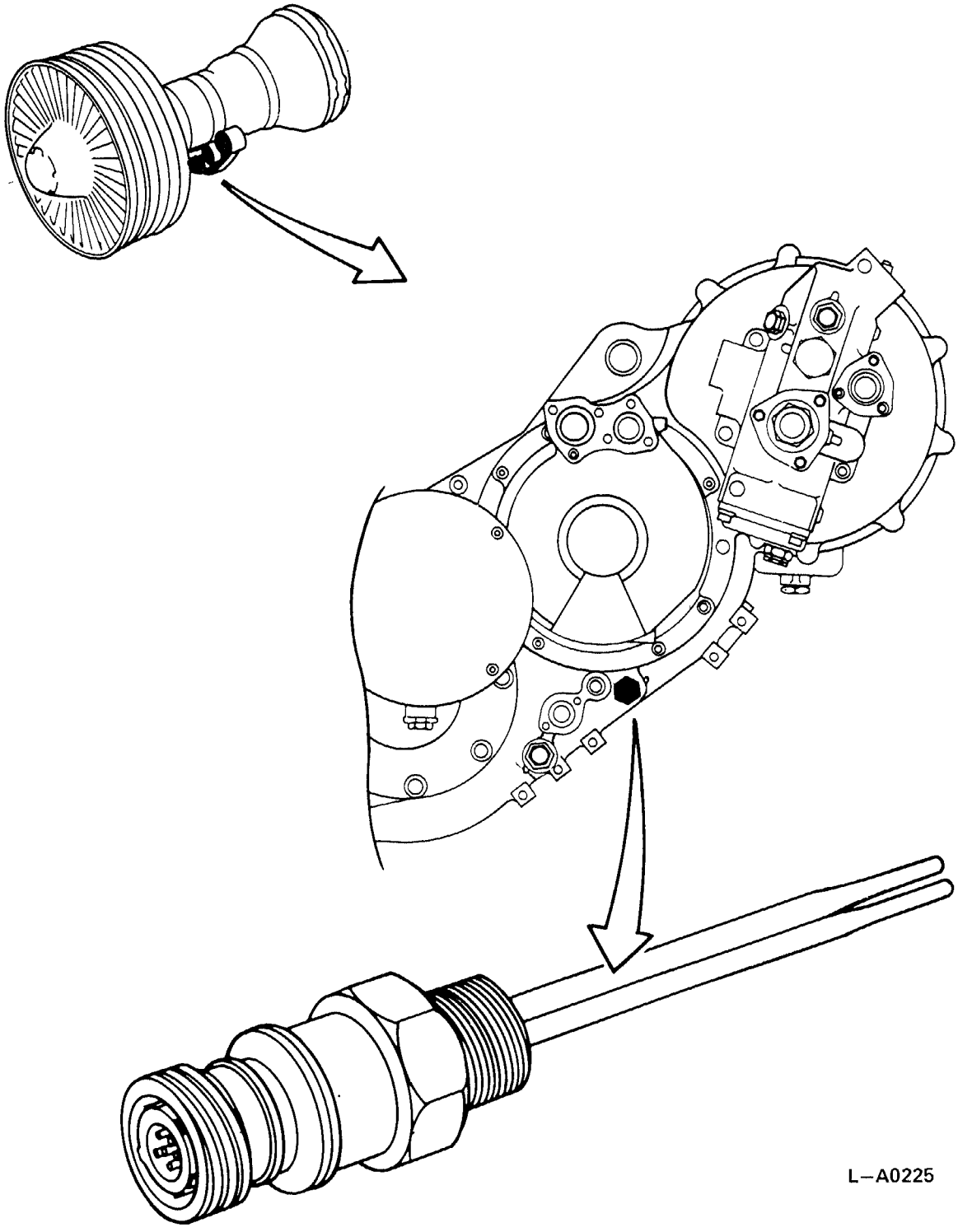
2. Oil Delta Temperature Indicating

A. General (Ref. Fig. 003)

The oil delta temperature is displayed on the ECAM display unit, in order to monitor the oil temperature at the outlet of the No. 3 bearing compartment. This oil temperature indicating is obtained by measuring the delta temperature between the oil outlet temperature of the No. 3 bearing compartment and the main line oil temperature.
The No. 3 bearing oil thermocouple probe is mounted in a tee fitting in the No. 3 bearing scavenge oil line just aft and to the right of the engine scavenge oil pump (Ref. Fig. 004).

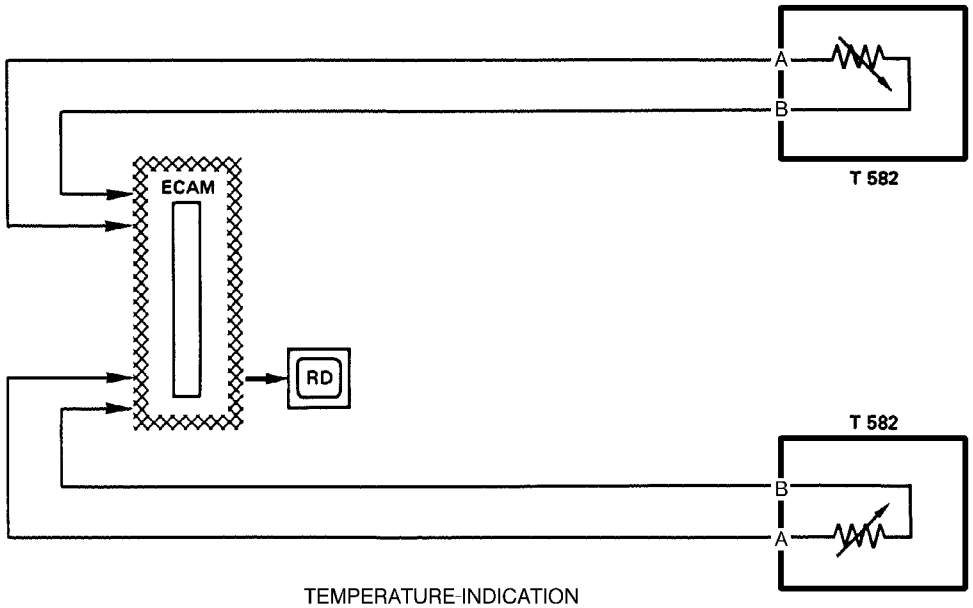
The probe resistance varies linearly with temperature.These signals are used by the SDAC and SGU to generate a digital signal displayed on the ECAM display unit.
The oil delta temperature indicating range should be 0° C to 99° C. The normal operating temperature is expected to be 15° C to 25° C.
An advisory flashing green is displayed on the ECAM display unit for an oil delta temperature of 44° C and above. In this case the crew will monitor the engine parameters and will report them after landing for a maintenance action.

NOTE : If the oil delta temperature (DOT 3) is greater than 44°C, a maintenance action is needed within 10 days. If the oil delta temperature (DOT 3) is greater than 55°C, a maintenance action is needed within 3 days.

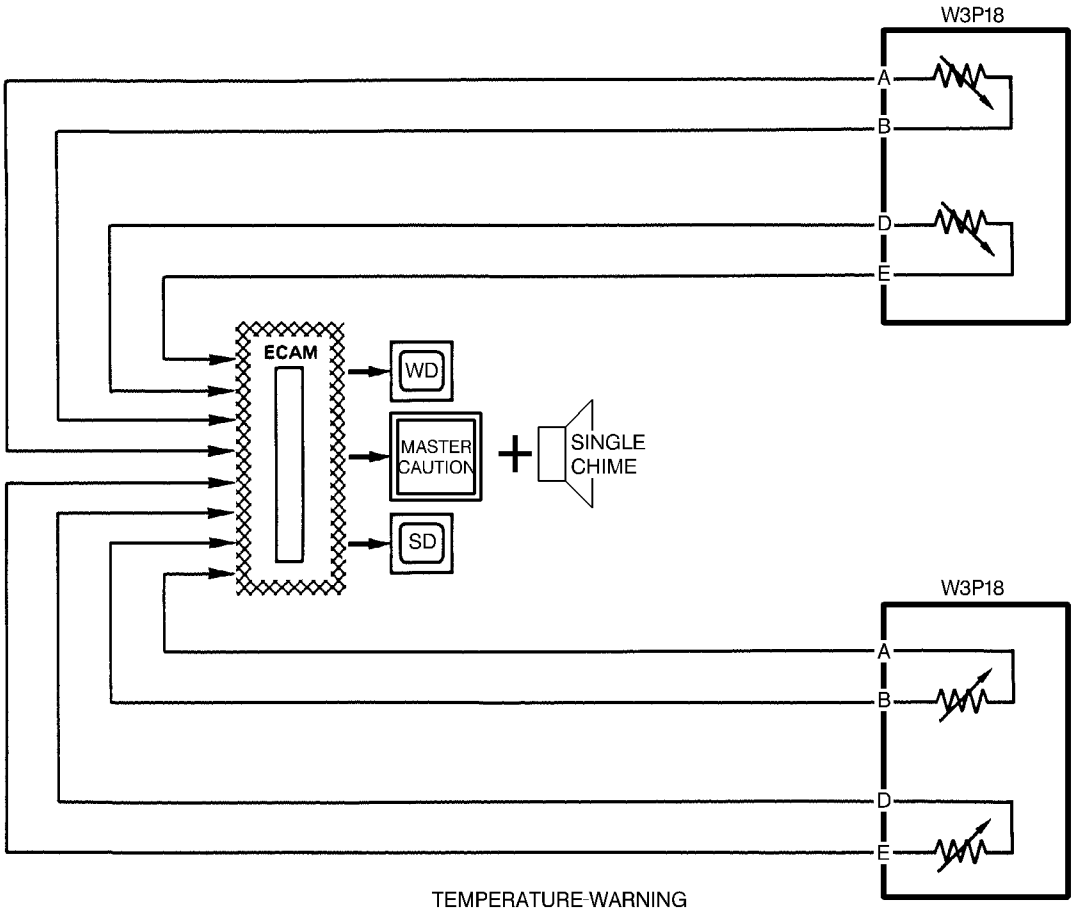


BM5 79 32 00 0 KCMO -18

Oil Temperature Thermocouple Probe
Figure 001



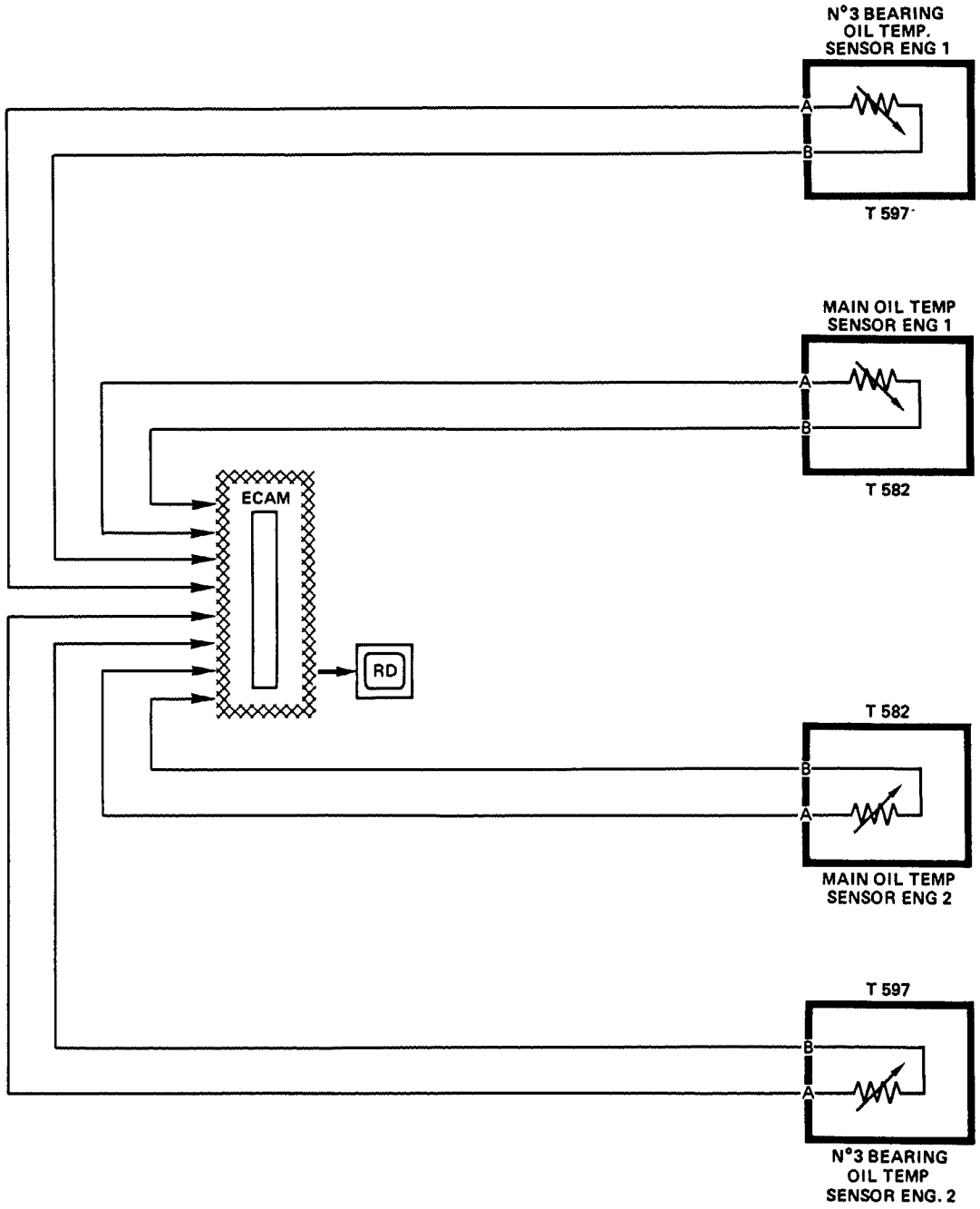
TEMPERATURE-INDICATION



TEMPERATURE-WARNING

BM5 79 32 00 0 KDM0 00

Oil Temperature Indication and Warning
Figure 002



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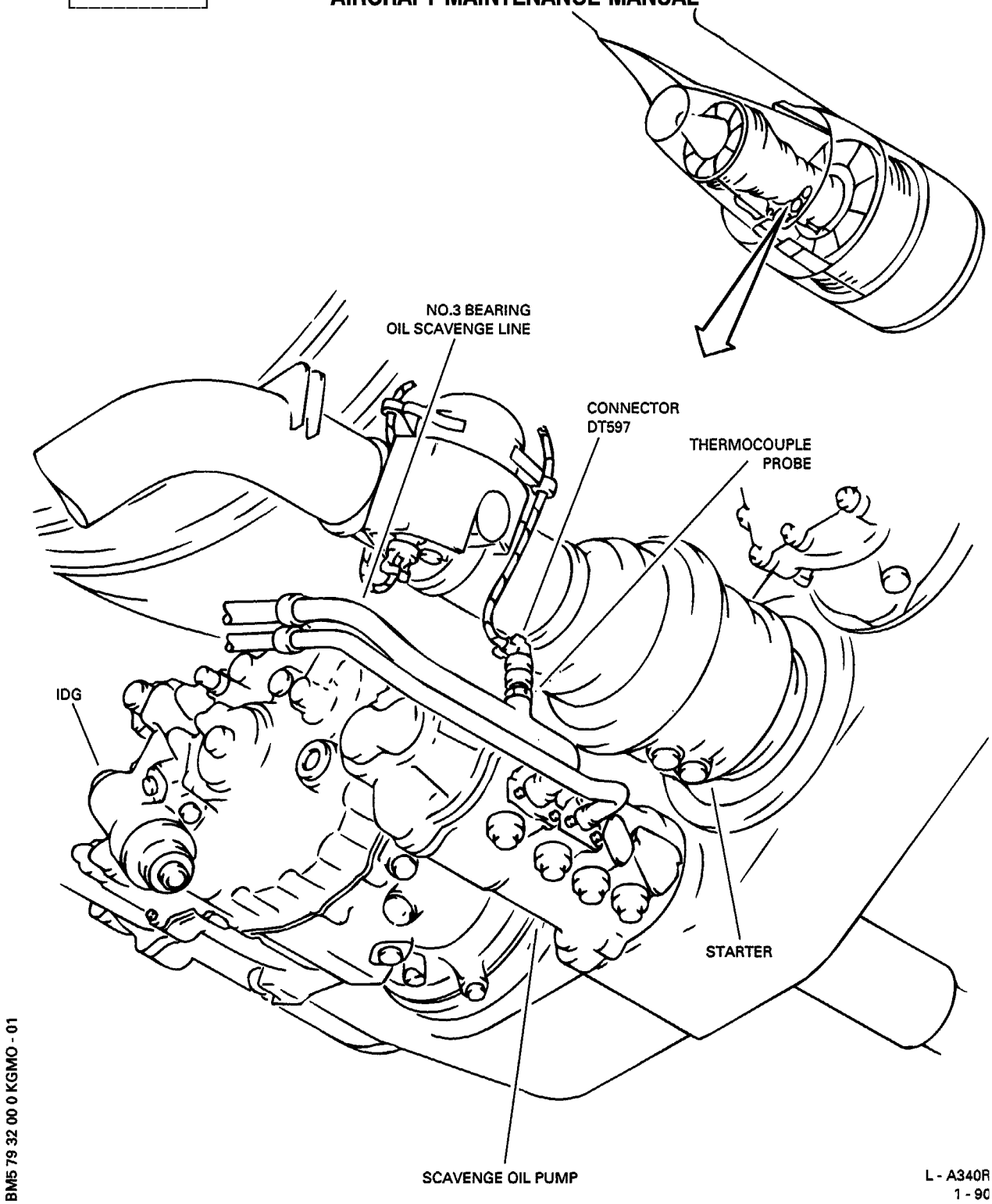
Oil Delta Temperature Indicating Electrical Circuit
Figure 003



No. 3 Bearing Oil Temperature Thermocouple Probe
Figure 004

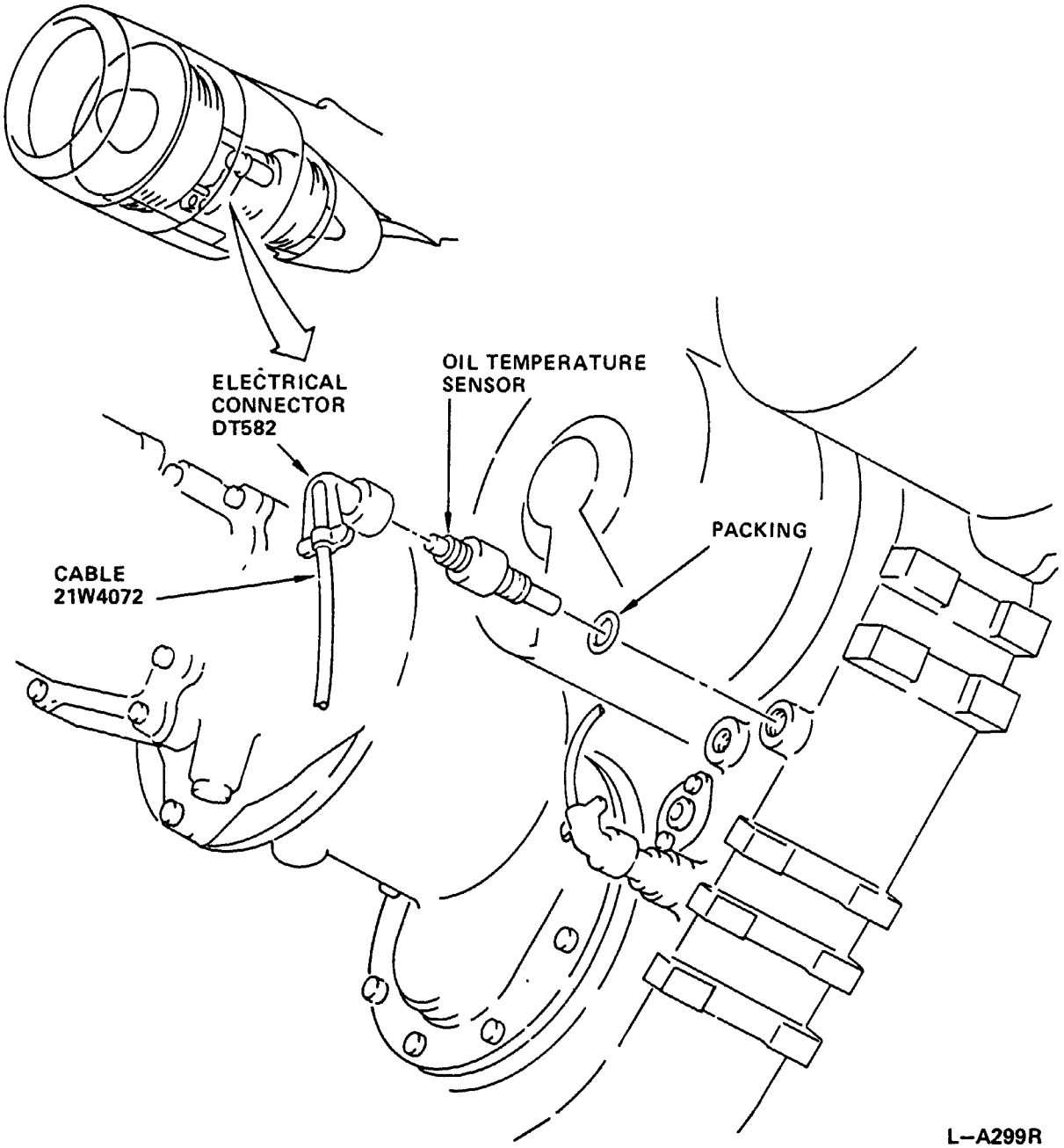
OIL TEMPERATURE SENSOR - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)

NOTE : Do not mistake the Oil Temperature Sensor located at DT 582 connector, for the FADEC Oil Temperature Thermocouple Probe located on the gearbox at connector P18.

A. The main gearbox oil temperature sensor is mounted in a boss on the main gearbox. The boss is located on the left front surface of the gearbox below the deoiler housing.

B. The sensor provides oil temperature data for the engine lubrication system to the flight deck.



BM5 79 32 11 0 KAMO - 00

Oil Temperature Sensor
Figure 001

OIL TEMPERATURE SENSOR - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Protective Covers
C.	Corrosion Resistant Steel Lockwire (MS20995C32) (Ref. 70-00-00)
D.	Packing
E. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

2. Procedure

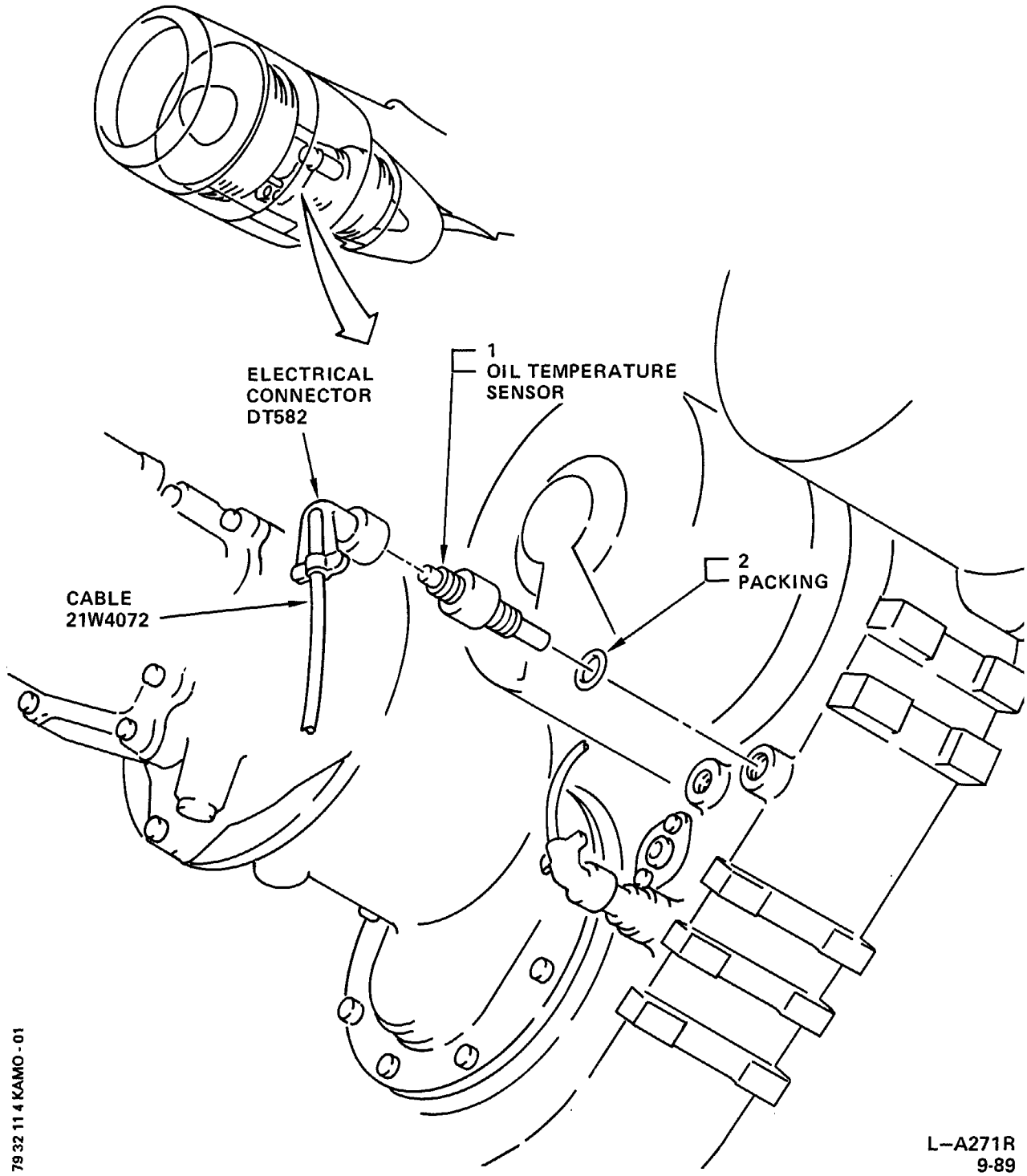
NOTE : Do not mistake the Oil Temperature Sensor located at DT582 connector, for the FADEC Oil Temperature Thermocouple Probe located on the gearbox at connector P18.

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)
(1)Disconnect electrical connector DT582 from temperature sensor.
(2)Remove lockwire from temperature sensor.
(3)Remove temperature sensor and place protective covers on electrical connector and open port.

C. Installation (Ref. Fig. 401)
(1)Remove all protective covers (Ref. Fig. 401)
(2)Lubricate packing (2) with Material No.P03-001, and position on oil temperature sensor (1).
(3)Install sensor and packing in main gearbox port and TORQUE to between 150 and 170 lbf.in. (1.70 and 1.92 m.daN.).
(4)Wirelock sensor.
(5)Connect electrical connector DT582 fingertight plus one-eighth turn.

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.



Oil Temperature Sensor, Main Gearbox
Figure 401

OIL TEMPERATURE SENSOR - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Ohmmeter
C. Material No.P05-058	Special Materials (Ref. 70-00-00)

Referenced Procedures

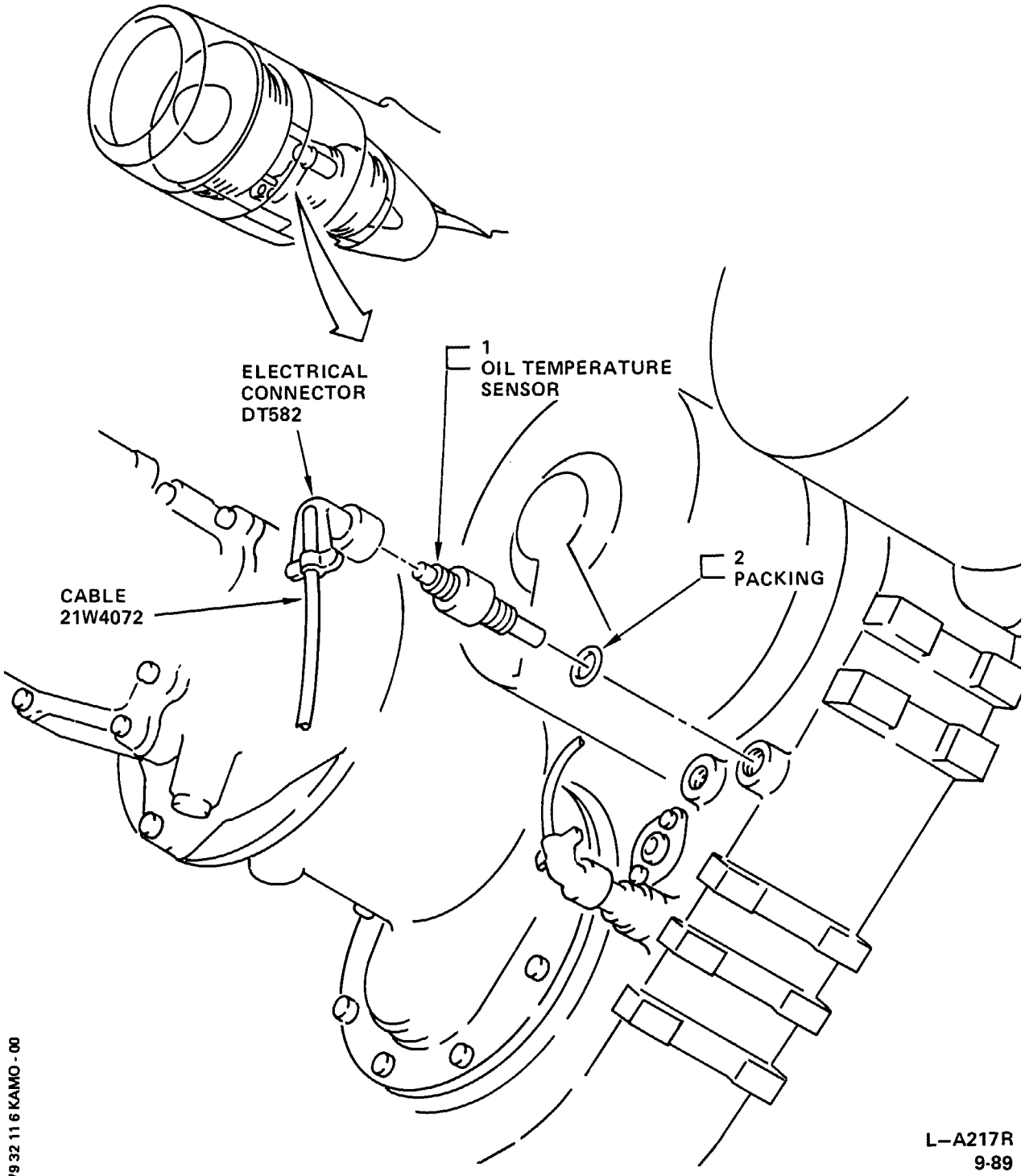
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors
- 79-32-11, P. Block 401	Oil Temperature Sensor

2. Visually Inspect Oil Temperature Sensor

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove oil temperature sensor (Ref. 79-32-11, P. Block 401).

B. Procedure (Ref. Fig. 601)
(1)Clean sensor and connector using Material No.P05-058 and a SPOP 208 solvent (Ref. 70-00-00, P. Block 201).
(2)Rinse clean and allow to dry.
(3)Using ohmmeter, check sensor for insulation resistance of 20 megaohms at 200VDC.
(4)If sensor fails to meet insulation resistance parameters, replace sensor.

C. Close-Up
(1)Install clean or replacement sensor (Ref. 79-32-11, P. Block 401).
(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.



Oil Temperature Sensor
Figure 601

No. 3 BEARING OIL TEMPERATURE THERMOCOUPLE PROBE - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Corrosion Resistant Steel Lockwire (MS20995G32) (Ref. 70-00-00)
C.	Packing
D. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

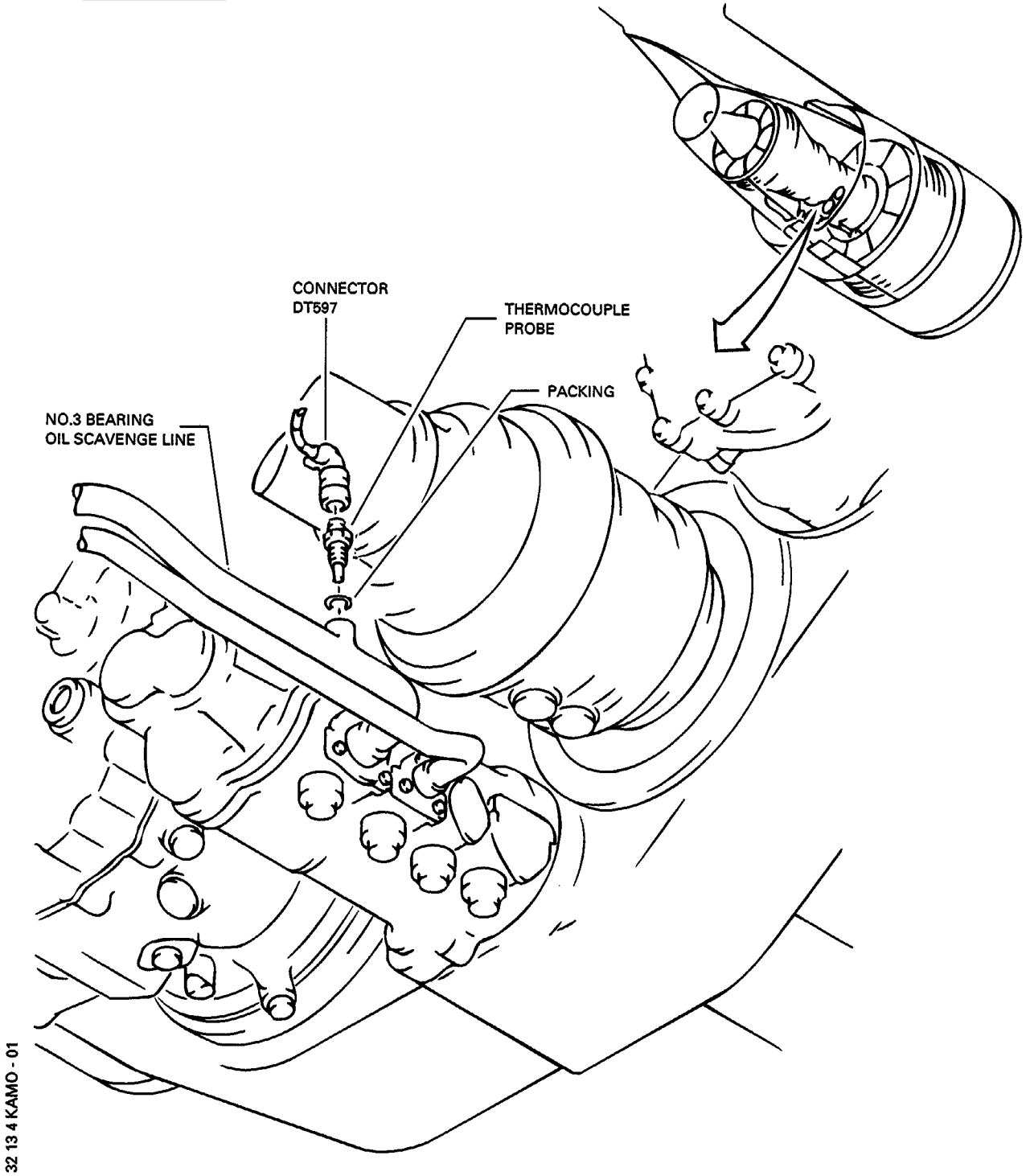
2. Procedure

A. Job Set-Up
(1) Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)
(1) Disconnect electrical connector DT597 from thermocouple probe.
(2) Remove lockwire from thermocouple probe.
(3) Remove thermocouple probe from No. 3 bearing scavenge oil line tee fitting and place protective covers on electrical connector DT597 and open port in tee fitting.

C. Installation (Ref. Fig. 401)
(1) Remove protective covers from electrical connector DT597 and tee fitting port.
(2) Lubricate packing with Material No.P03-001 and position on thermocouple probe.
(3) Install thermocouple probe and packing in tee fitting port of No. 3 bearing scavenge oil line. TORQUE probe to between 90 and 100 lbf.in. (1.016 and 1.129 m.daN).
(4) Wirelock probe.
(5) Connect electrical connector DT597 and tighten fingertight plus one-eighth turn.

D. Close-Up
(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2) Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.



No. 3 Bearing Oil Temperature Thermocouple Probe
Figure 401

OIL PRESSURE AND LOW OIL PRESSURE WARNING - DESCRIPTION AND OPERATION

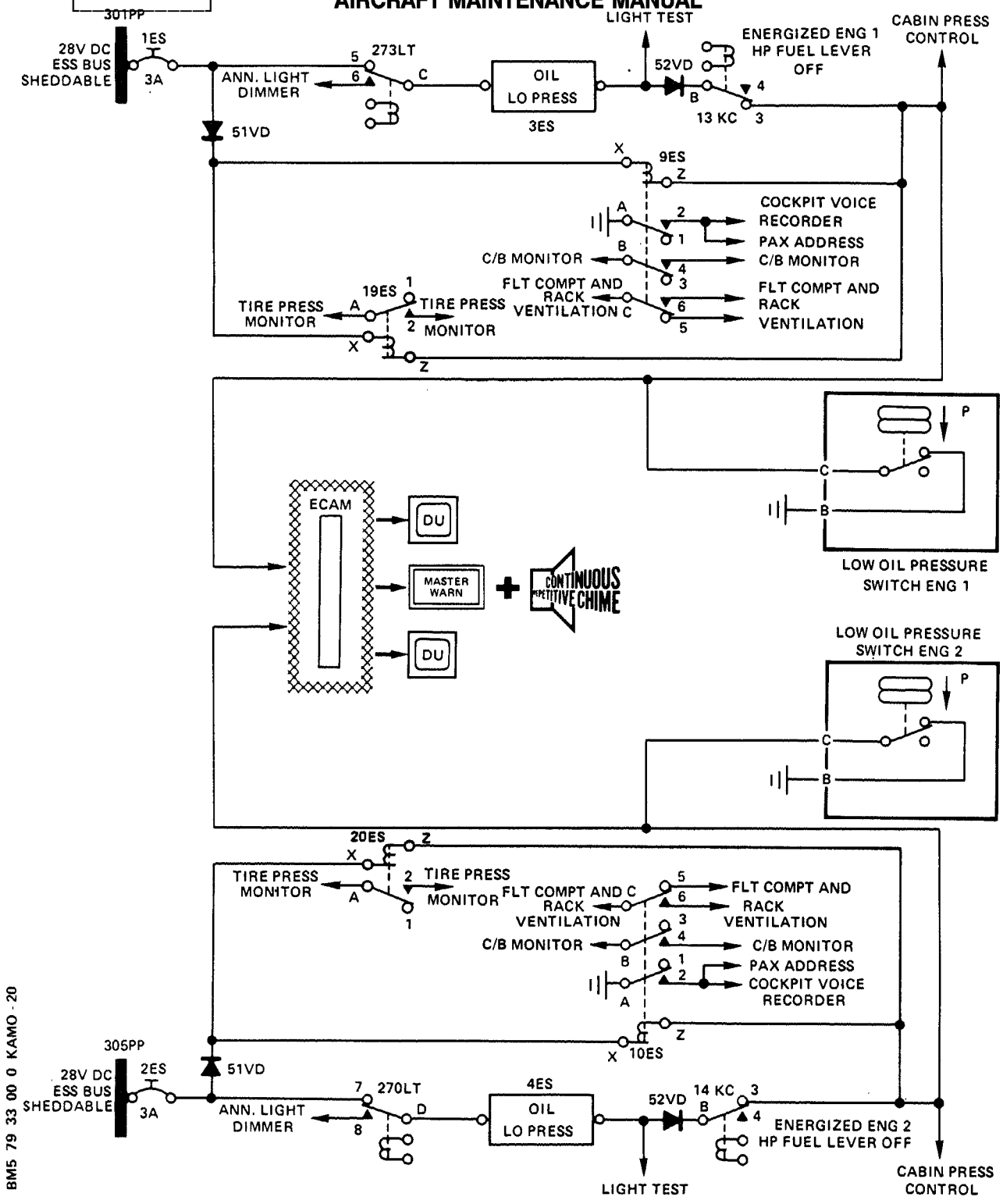
1. General (Ref. Fig. 001, 002, 003)

A. Oil Pressure Transmitter (Ref. Fig. 003)
The oil pressure transmitter is connected at the fuel/oil cooler outlet. With power supplied through the indicator, the winding movement results in inductance variation creating an unbalanced bridge circuit. The resultant current variation changes the flight compartment indicator moving coil. The oil pressure actuates the diaphragm against a spring inside the transmitter, causing a winding to move (range 0 to 550 psig).

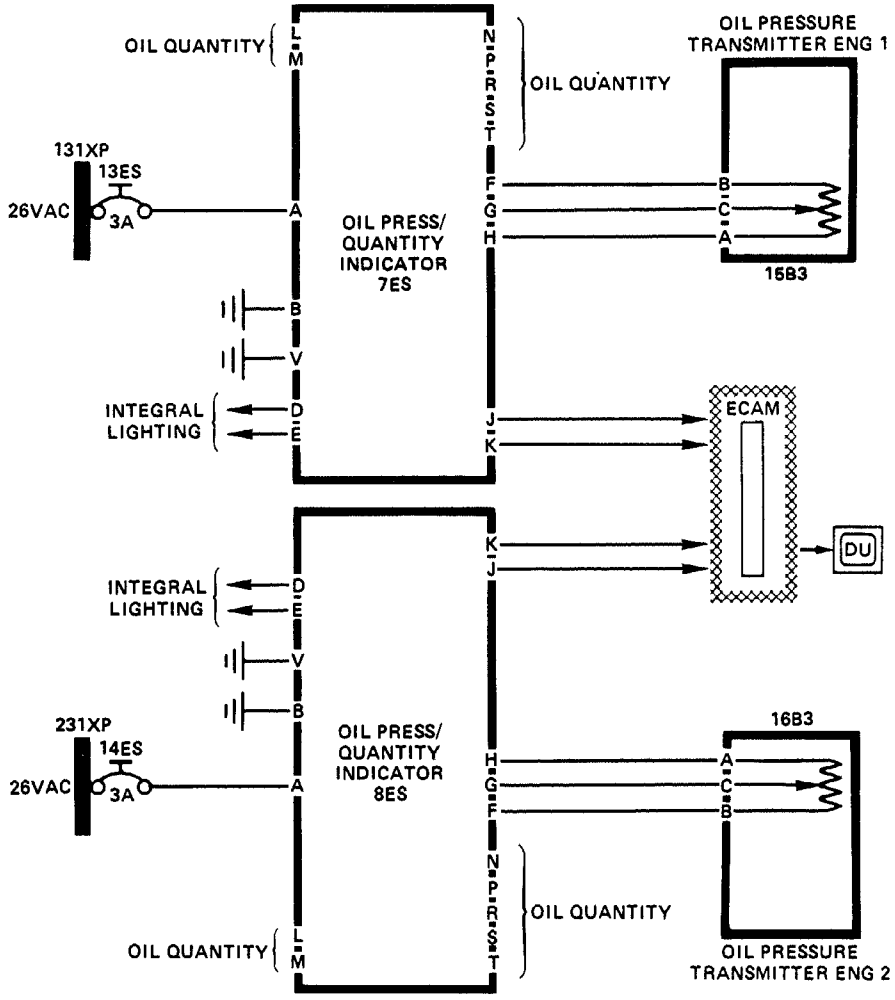
B. Oil Pressure Indication
The transmitter analog signal is sent to the indicator (graduated from 0 to 400 psig, accuracy ± 1.5 %). The indicator is supplied with 26VAC from normal busbar 131XP (231XP) via circuit breaker 13ES (14ES), the normal operating range is between 85 and 400 psig, the redline is at 70 psig.
The indicator is located below the main instrument panel on panel 463VU.
This indicator features a test switch (BITE) located on the back and enabling oil pressure measurement channel to be tested.
When the BITE is selected by turning (in the arrow diection) and maintaining the BITE screw, the oil quantity pointer goes to the "blue dot" mark (340 PSI).
The indicator returns to initial configuration when the BITE screw is released.
A recopy of the indicator is sent to the System Data Analog Converter (SDAC) which converts the analog signal into a digital form and display it on the ECAM display unit via the SGU.
If the ENGINE page is displayed, this signal gives the oil pressure on a vertical scale graduated from 0 to 400 psi, when the decreasing pressure reaches 75 psi and advisory is flashing (green) on ECAM display unit ; when this pressure reaches 70 psi (warning limit) the digital values are displayed in red.

C. Low Oil Pressure Switch (Ref. Fig. 004)
At the same location, of the oil pressure transmitter a switch is installed, which activates OIL LO PRESS warning light, as well as the ECAM display unit.
Operating on 28VDC the switch is a diaphragm type with dual contacts.
The OIL LO PRESS warning light comes on red when the oil pressure reaches 67 psid (min) with a decreasing pressure. It extinguishes when the pressure reaches 83 psid (max) with an increasing pressure. The OIL LO PRESS warning light is inhibited when HP fuel shut-off valve lever is in OFF position.
In the event of an OIL LO PRESS warning in flight, the throttle must be retarded as much as possible, while monitoring other engine parameters, to avoid any further engine deterioration.

2. Component location
(Ref. Fig. 005)

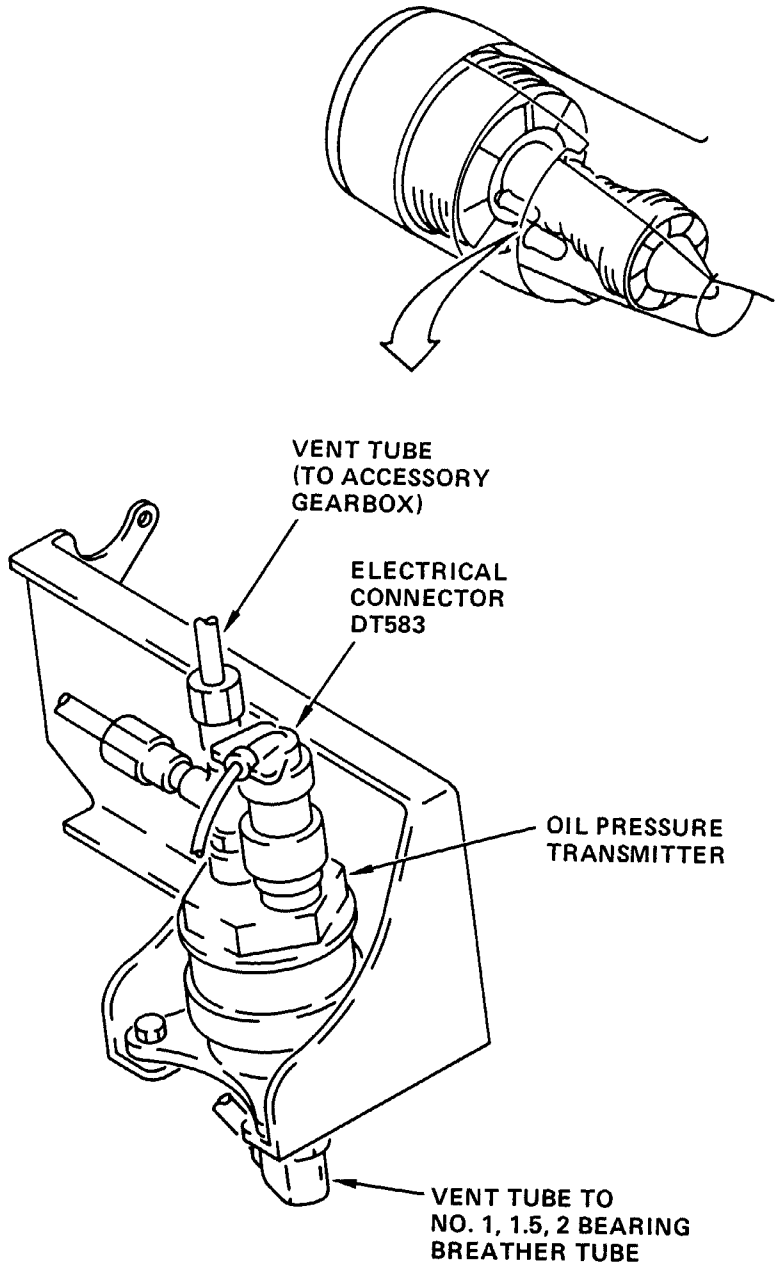


Oil Low Pressure Warning - Electrical Circuit
Figure 001



BM5 79 33 00 0 KAN0 01

Oil Pressure Indication - Schematic
Figure 002



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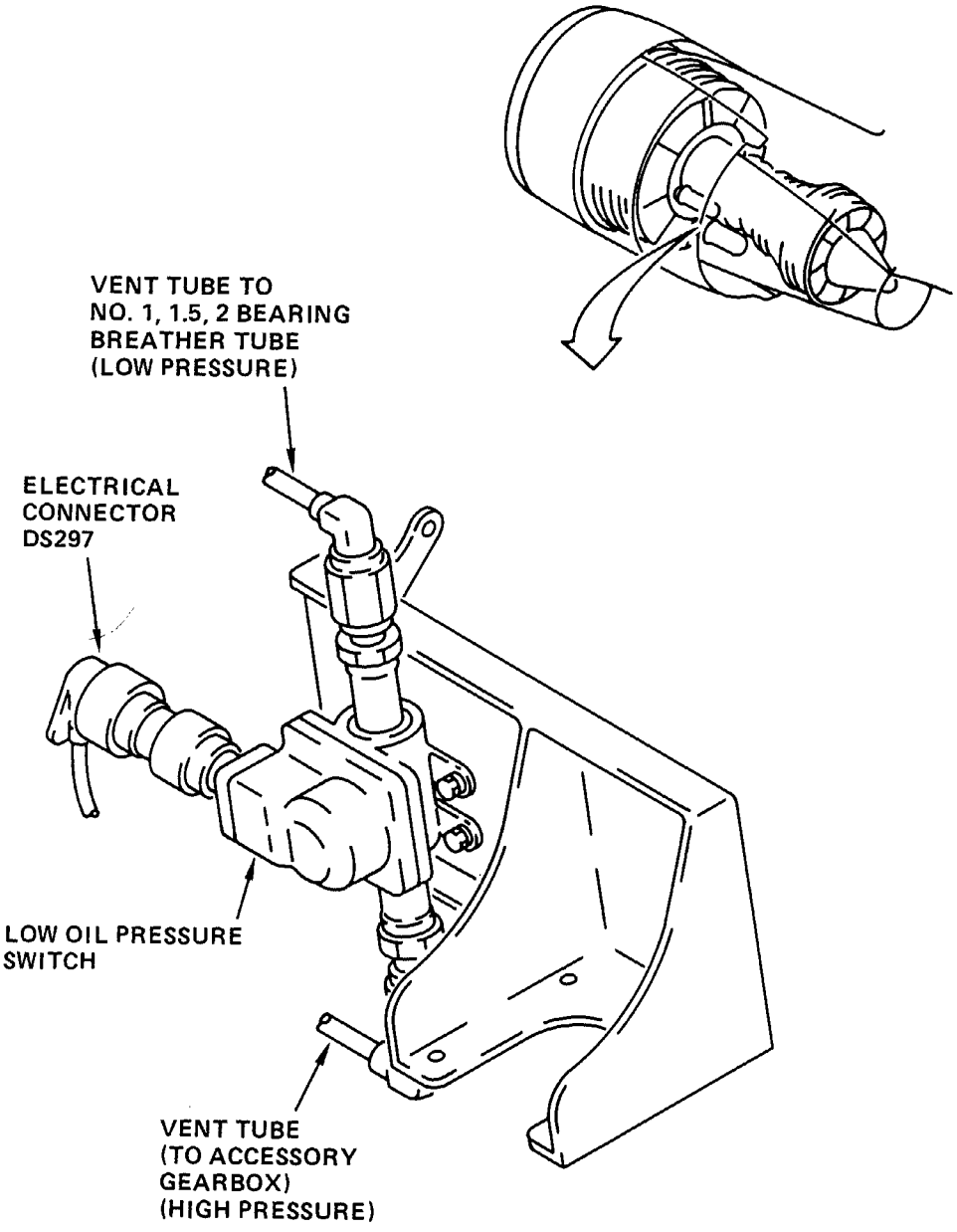
L–A124R
6–90

Oil Pressure Transmitter
Figure 003

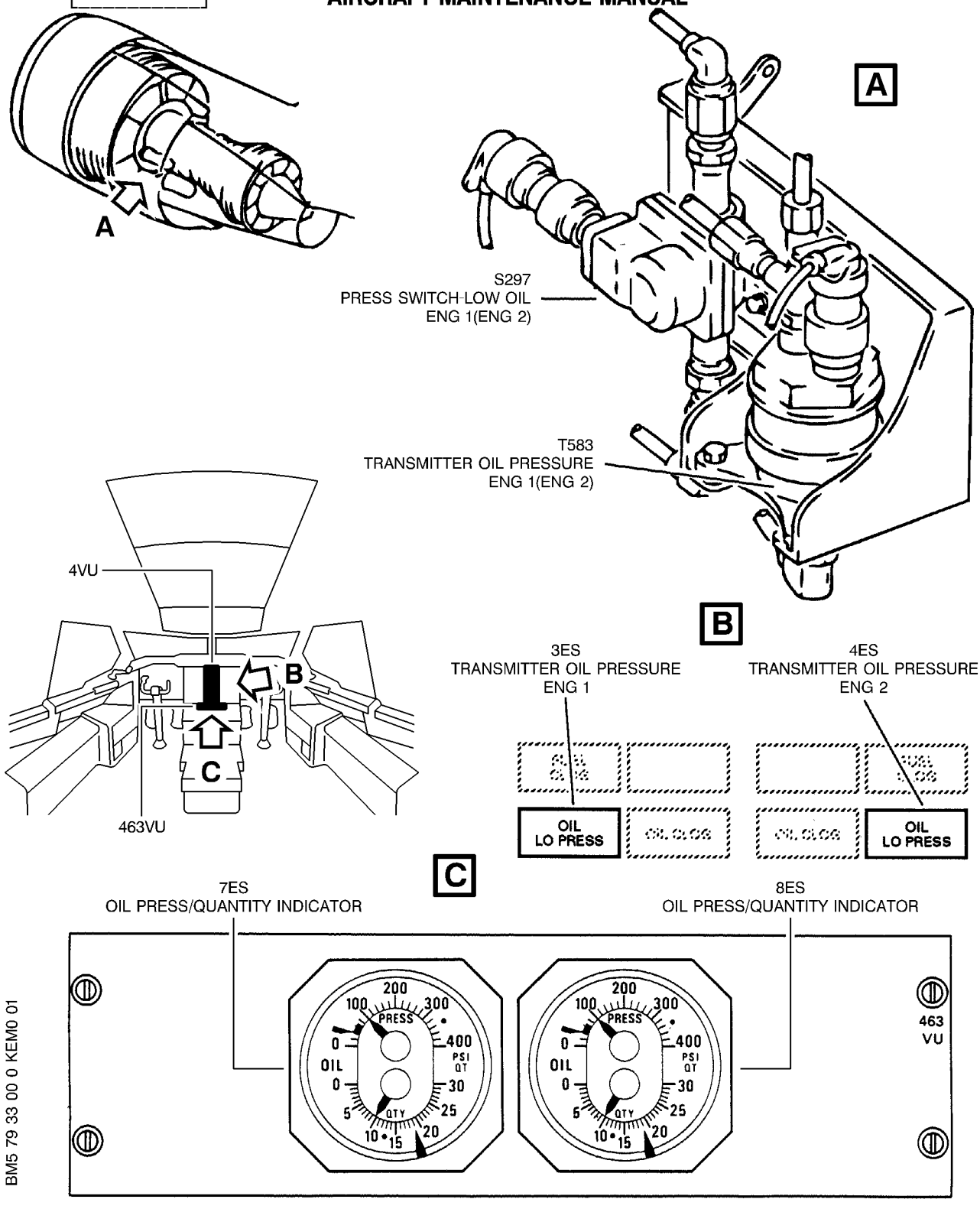


BM5 79 33 00 0 KGMO - 00

L–A125R
6–90

Low Oil Pressure Switch
Figure 004

FIN	FUNCTIONAL DESIGNATION	PANEL	ZONE	ACCESS DOOR	ATA REF.
T583	TRANSMITTER - OIL PRESSURE,		451	435AL	79-33-11
	ENG1 (ENG2)		461	445AL	
3ES	WARNING LIGHT - OIL LO PRESS,	4VU	211		79-33-00
4ES	ENG1 (ENG2)	4VU	212		
S297	PRESS SWITCH - LOW OIL		451	435AL	79-34-11
	ENG1 (ENG2)		461	445AL	
7ES	INDICATOR - OIL PRESS/QUANTITY	463VU			79-33-21
8ES	INDICATOR - OIL PRESS/QUANTITY	463VU			79-33-21



Oil Pressure and Low Oil Pressure
Warning - Component Location
Figure 005

OIL PRESSURE AND LOP WARNING - ADJUSTMENT/TEST

1. Reason
These procedures, deal with the oil pressure and low pressure systems.

2. Equipment and Materials

ITEM	DESIGNATION
A.	HP Ground Air Supply
B.	Container Suitable for Oil
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-00-00, P. Block 501	Power Plant - General
- 24-41-00, P. Block 301	AC External Power Control
- 12-13-79, P. Block 1	Replenishing Oil - Engines
- 79-34-11, P. Block 401	Low Oil Pressure Switch
- 31-51-00, P. Block 1	ECAM System

3. Operational Test

A. Job Set-Up
(1)Energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).
(2)Make certain that electronics racks ventilation is correct.
(3)ECAM system operating (Ref. 31-51-00, P. Block 1)

B. Test

ACTION	RESULT
1. Open circuit breaker for the appropriate engine (3KC) ENG1/FUEL/HP VALVE/CTL (Location, panel 133VU, 333T69) (4KC) ENG2/FUEL/HP VALVE/CTL (Location, panel 133VU, 333T70)	On panel 4VU, OIL LO PRESS warning light comes on.
2. After a delay (refer to NOTE)	On CAPT and F/O main instrument panels 3VU and 5VU : - MASTER WARN lights flash, - MASTER CAUTION lights go on, - continuous repetitive chime sounds, - message ENG1(2) OIL LOW PRESS is displayed on L ECAM display unit, - ENGINE page is displayed on R ECAM display unit and OIL pressure is shown in red.
3. Close circuit breaker for the appropriate engine 3KC, 4KC	On panel 4VU, OIL LO PRESS warning light goes off. On CAPT and F/O main instrument panels 3VU and 5VU : - MASTER WARN lights go off. - MASTER CAUTION lights go off, - continuous repetitive chime stops, - message on L ECAM display unit disappears, - ENGINE page on R ECAM display unit disappears.

NOTE : Delay is 70 seconds approx. However, for some FWC configurations, this delay has been extended to 100 seconds approx.
The delay value is for information only.

4. Accuracy test
WARNING : A MINIMUM OF FIVE MINUTES SHOULD ELAPSE AFTER ENGINE SHUTDOWN BEFORE PERFORMING THE FOLLOWING TEST TO ALLOW OIL PRESSURE TO BLEED OFF.

A. Job Set-Up

NOTE : This test is performed with engine shut down.

(1)Open, safety and tag appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)Energize the aircraft electrical network (Ref. 24-41-00, P. Block 301) and make certain that electronics rack ventilation is correct.

(3)Make certain that ECAM system is operating (Ref. 31-51-00, P. Block 1).

(4)Make certain that following circuit breakers are closed .

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES/OIL/ENG1/LO PRESS	1ES	336/Q69
133VU	ENGINES/OIL/ENG2/LO PRESS	2ES	336/Q72
133VU	ENGINES/OIL/ENG1/PRESS	13ES	336/Q70
133VU	ENGINES/OIL/ENG2/PRESS	14ES	336/Q71

(5)Position a container under tube coupling to be disconnected (Ref. Fig. 501)

(6)Disconnect tube coupling from tee fitting (Ref. Fig. 501).

(7)Connect compressed air source at tee fitting.

B. Procedure

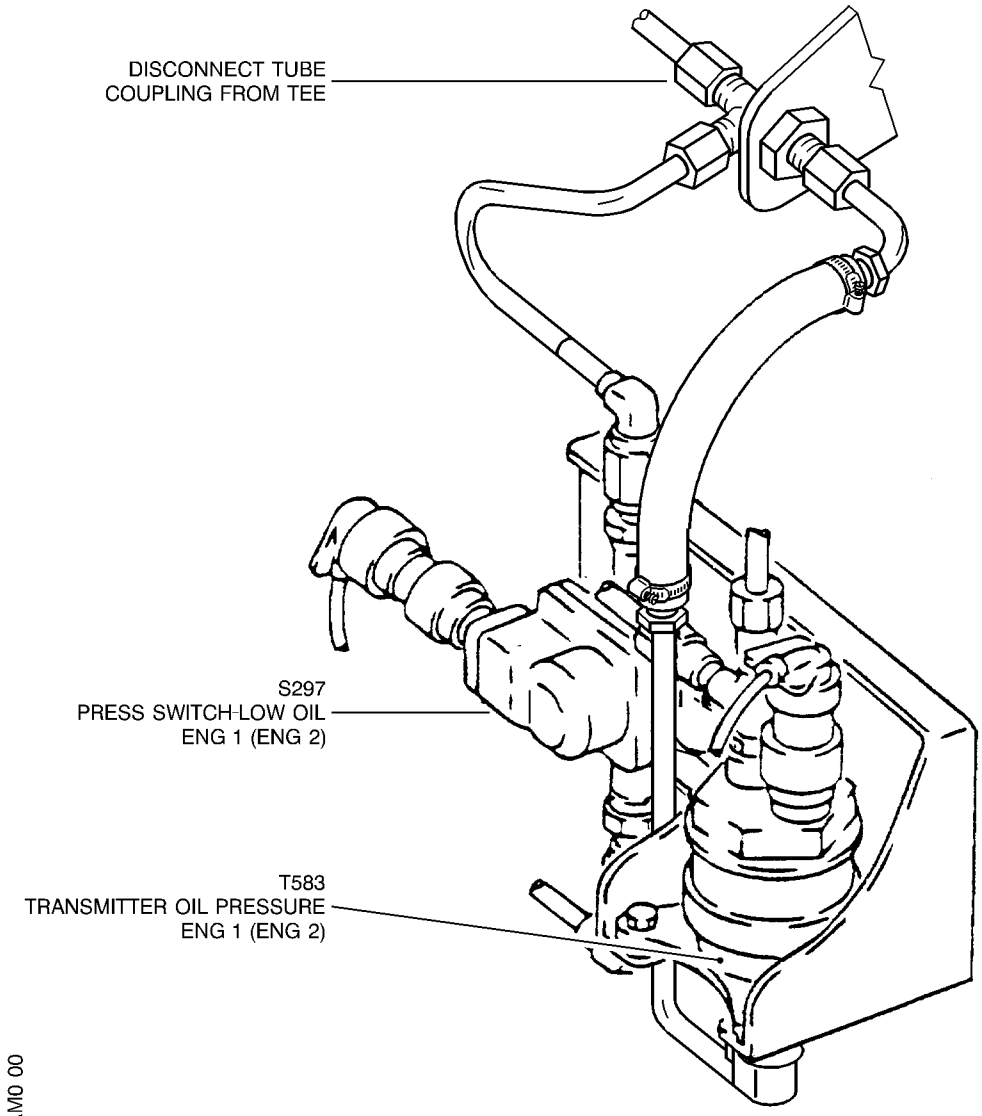
(1)Test of the pressure transmitter (T583)

ACTION	RESULT
1. Slowly supply compressed air at 80 psi	
2. Slowly reduce air pressure	On R ECAM display unit, check that the digital values are displayed in red when pressure decreases to 70 ± 6 psi.
3. Increase compressed air at 85 psi.	

(2)Test of the Low Oil Pressure switch (S297)

ACTION	RESULT
1. Open C/B 3KC (4KC) and wait 70 seconds	
2. Slowly reduce air pressure	Check that : - on panel 4VU, OIL LO PRESS warning light comes on - on CAPT and F/O main instrument panels 3VU and 5VU, MASTER WARN lights flash - continuous repetitive chime sounds - on L ECAM display unit, a message is displayed when pressure decreases to 70 ± 3 psi.
3. Close C/B 3KC (4KC).	

C. Close-Up
(1)Stop and disconnect compressed air source.
(2)Connect tube coupling to tee fitting. TORQUE coupling to between 135 and 150 lbf.in. (1.53 and 1.69 m.daN).
(3)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(4)Press CLR pushbutton switch on ECAM control panel 11VU.
(5)Dry motor engine (Ref. 71-00-00, P. Block 501) and check for leakage.
(6)Check oil level after engine coast down (Ref. 12-13-79, P. Block 1).
(7)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(8)De-energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).



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Air Source Connection
Figure 501

OIL PRESSURE TRANSMITTER - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Protective Covers
C.	Container
D.	Packings
E.	Torque Wrench
F. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 12-13-79, P. Block 1	Engine (Engine Oil System)
R - 71-00-00, P. Block 501	Power Plant - General

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENG1/OIL PRESS	13ES	336/Q70
133VU	ENG2/OIL PRESS	14ES	336/Q71

(2)Open, safety and tag the appropriate circuit breakers and open fan cowl and thrust reverser doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)

(1)Disconnect electrical connector, DT583, from oil pressure transmitter and place protective covers on connector and receptacle.

(2)Place oil container under oil pressure transmitter.

WARNING : WHEN PERFORMING MAINTENANCE ON AN ENGINE THAT HAS BEEN RECENTLY USED OR RUN, EXERCISE CAUTION WHEN DISCONNECTING OIL LINES, AS HOT ENGINE OIL CAN CAUSE SERIOUS INJURY TO EYES OR SEVERE BURNS TO PERSONNEL.

(3)At tee, mounted on top of oil pressure transmitter, disconnect oil lines from top and center of tee.

(4)Remove tee, jamnut and packing from oil pressure transmitter. Discard packing.

(5)At bottom of oil pressure transmitter, disconnect oil line from union coupler. Remove and discard packing.

(6)Place protective covers over open oil lines and ports.

(7)Remove nuts, washers and bolts attaching oil pressure transmitter to bracket and remove transmitter.

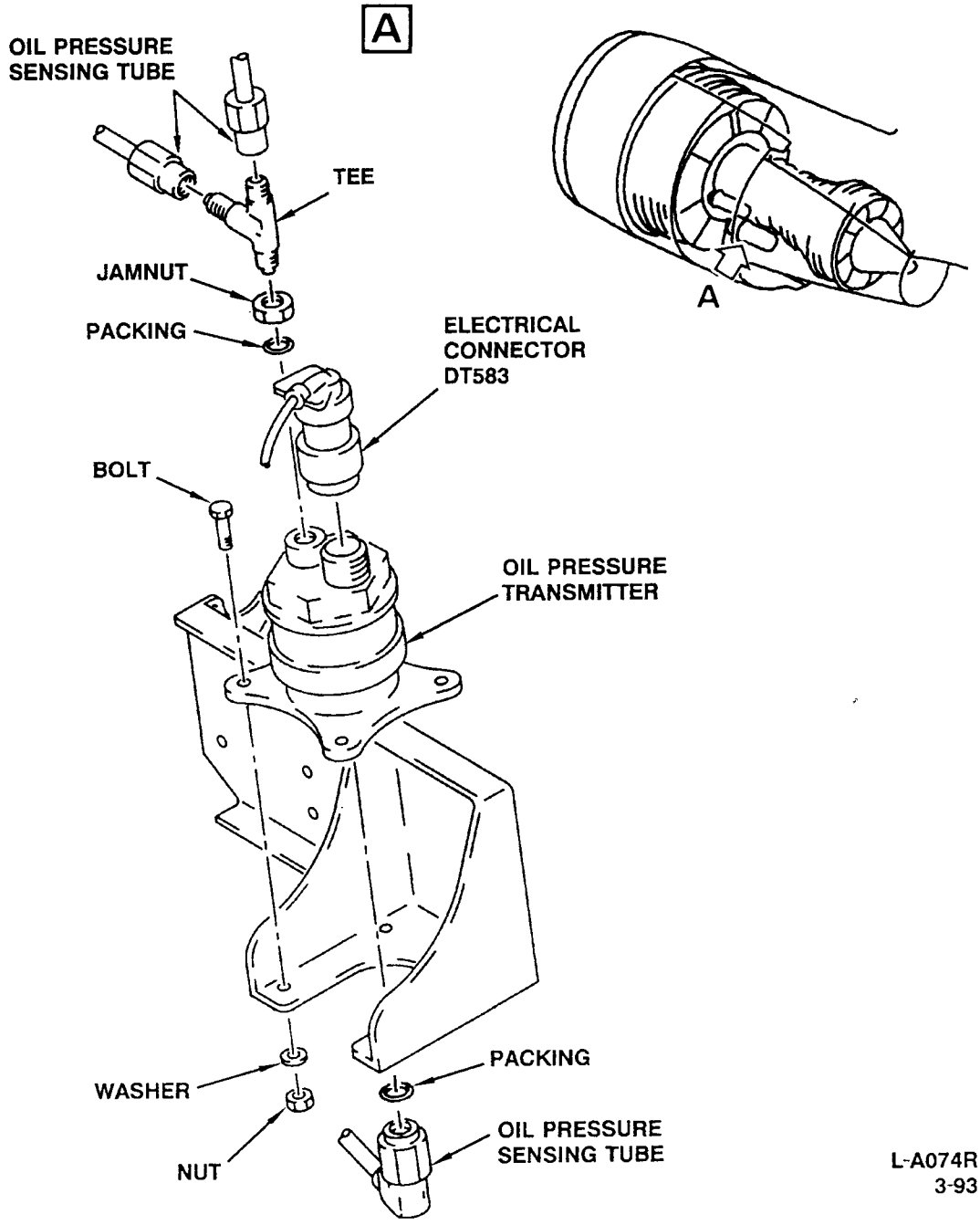
C. Installation (Ref. Fig. 401)

(1)Remove all protective covers.

(2)Lubricate bolts with Material No.P03-001.

(3)Using bolts, washers and nuts ; position transmitter on mounting bracket placing tee connection port to the left (forward) and electrical receptacle to the right (rear). TORQUE nuts to between 50 and 70 lbf.in. (0.56 and 0.79 m.daN).
(4)Install tee, on transmitter top surface, as follows :
(a)Install jamnut fingertight on tee.
(b)Lubricate packing with Material No.P03-001, and position on tee.
(c)Install tee fingertight on transmitter taking care not to cut packing with threads.
(d)Align tee to mate with oil lines. Hold in position and TORQUE jamnut to between 90 and 100 lbf.in. (1.02 and 1.13 m.daN).
(5)Connect oil lines to top of tee and to side of tee, and TORQUE couplings to between 135 and 150 lbf.in. (1.53 and 1.70 m.daN).
(6)Install union coupler on bottom surface of transmitter as follows :
(a)Lubricate packing with Material No.P03-001, and position on union coupler.
(b)Install coupler fingertight on transmitter and ensure that packing has not been cut by coupler threads.
(c)Torque coupler to between 90 and 100 lbf.in. (1.02 and 1.12 m.daN).
(7)At bottom of transmitter, connect oil line to union coupler and TORQUE to between 135 and 150 lbf.in. (1.53 and 1.70 m.daN).

D. Close-Up
(1)Service engine oil system (Ref. 12-13-79, P. Block 1).
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
R (3)Do an engine idle leak test (Ref. 71-00-00, P. Block 501).
R (4)Close thrust reverser and fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301) 13ES and 14ES.



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Oil Pressure Transmitter
Figure 401

OIL PRESSURE AND QUANTITY DUAL INDICATOR - REMOVAL/INSTALLATION

NOTE : Removal/Installation procedures for OIL PRESS & QTY indicators on L and R engines are identical.

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Blanking Caps/Plugs
Referenced Procedures	
- 24-41-00, P. Block 301	AC External Power Control
- 71-00-00, P. Block 501	Power Plant-General

2. Procedure

A. Job-Set-Up
(1)Open, safety and tag the following circuit breakers :

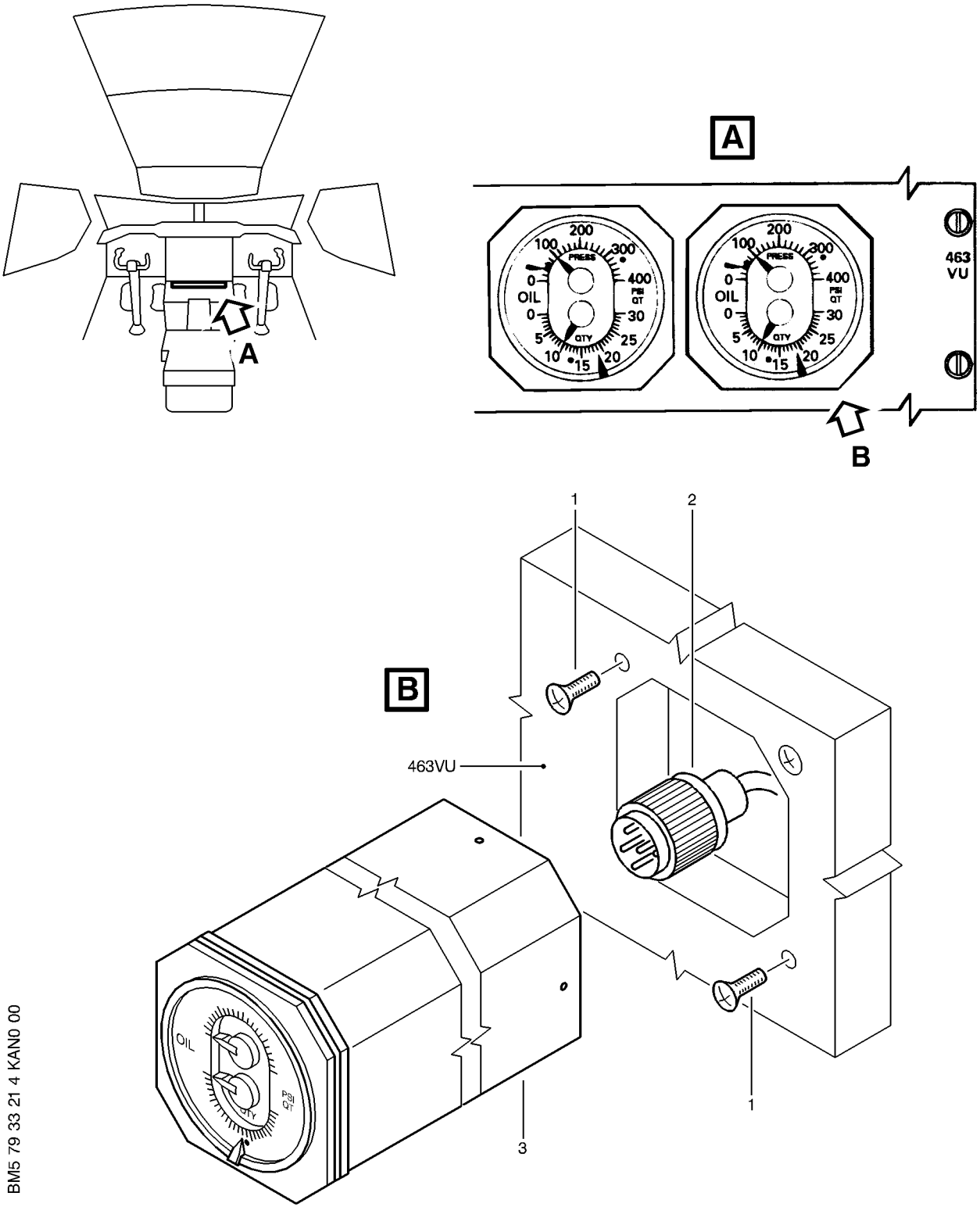
PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES-OIL ENG 1 QTY	1EN	336/Q68
133VU	ENGINES-OIL ENG 2 QTY	2EN	336/Q73
133VU	ENGINES-OIL ENG 1 PRESS	13ES	336/Q70
133VU	ENGINES-OIL ENG 2 PRESS	14ES	336/Q71

B. Removal
(Ref. Fig. 401)
(1)On face of panel 463VU, remove two screws (1) attaching OIL PRESS & QTY indicator.
(2)Remove OIL PRESS & QTY indicator (3) from panel 463VU.
(3)Disconnect OIL PRESS & QTY indicator and blank off plug and receptacle (2).

C. Installation
(1)Check housing of OIL PRESS & QTY indicator on panel 463VU.
(2)Remove blanking caps from plug and receptacle (2) and connect plug.
(3)Install OIL PRESS & QTY indicator (3) in panel 463VU.
(4)Attach OIL PRESS & QTY indicator (3) to panel 463VU with two screws (1).
(5)Remove safety clips and tags and close circuit breakers 1EN, 2EN, 13ES, and 14ES.

D. Test
(1)Energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).
(2)Check the oil quantity pointer indiquate a value.
(3)Perform an engine dry motoring (Ref. 71-00-00, P. Block 501) and check the oil pressure pointer is increasing.

E. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.



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Oil Pressure and Quantity Indicator
Figure 401

(2)Restore aircraft systems to normal operating condition.

LOW OIL PRESSURE SWITCH - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Protective Covers
C.	Container
D.	Packing
E.	Torque Wrench
F. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES/OIL ENG1 LO PRESS	1ES	336/Q69
FOR ENGINE 2			
133VU	ENGINES/OIL ENG2 LO PRESS	2ES	336/Q72

(2)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)

(1)Disconnect electrical connector DS297 and install protective covers on connector and receptacle.

(2)Place container under low oil pressure switch to catch engine oil when oil line connectors are loosened or removed.

WARNING : WHEN PERFORMING MAINTENANCE ON AN ENGINE THAT HAS BEEN RECENTLY USED OR RUN, EXERCISE CAUTION WHEN DISCONNECTING OIL LINES, AS HOT ENGINE OIL CAN CAUSE SERIOUS INJURY TO EYES OR SEVERE BURNS TO PERSONNEL.

(3)At bottom of low oil pressure switch, disconnect oil line coupler from union.

(4)At top, left of oil pressure transmitter, disconnect oil line coupler from center of tee.

(5)At top of low oil pressure switch, disconnect oil line coupler.

(6)On mounting bracket above low oil pressure switch, disconnect oil line coupler from center of bulkhead tee.

(7)Place protective covers on all open oil lines and ports.

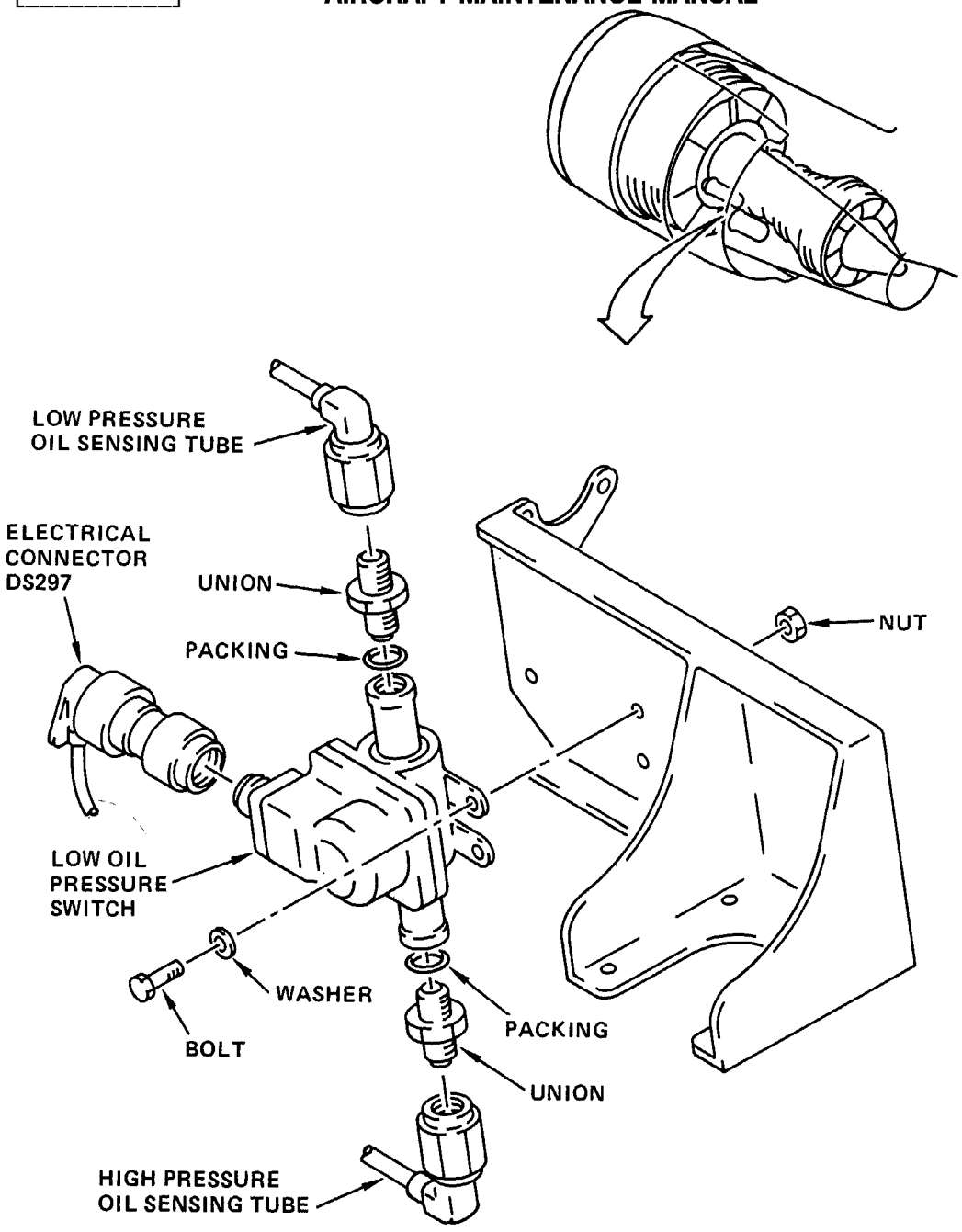
(8)Remove bolts, washers and nuts attaching switch to mounting bracket.

(9)Remove low oil pressure switch.

C. Installation (Ref. Fig. 401)

(1)Lubricate bolts with Material No.P03-001.
(2)Position low oil pressure switch on mounting bracket with electrical receptacle facing left (forward) and install with bolts, washers and nuts retained on removal. TORQUE nuts to between 50 and 70 lbf. in. (0.56 and 0.79 m.daN).
(3)Install connecting unions on switch as follows :
(a)Remove protective covers from open ports on switch.
(b)Lubricate packings with Material No.P03-001, and position on unions.
(c)Install unions on switch and TORQUE to between 90 and 100 lbf.in. (1.02 and 1.13 m.daN).
(4)Remove all protective covers from oil lines and ports.
(5)Replace oil line that connects top of switch to center port of bulkhead tee. Tighten couplers fingertight, then TORQUE couplers to between 135 and 150 lbf. in. (1.53 and 1.70 m.daN).
(6)Replace oil line that connects bottom of switch to oil pressure transmitter tee. Tighten couplers fingertight, then TORQUE couplers to between 135 and 150 lbf. in. (1.53 and 1.70 m.daN).
(7)Remove protective covers from electrical cable and receptacle.
(8)Connect electrical connector, DS297, to receptacle and tighten connector fingertight plus one-eighth turn.

D. Close-Up
(1)Service engine oil system (Ref. 12-13-79, P. Block 1).
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P.Block 301).
(4)Remove safety clips and tags and close circuit breakers : 1ES, 2ES.



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Low Oil Pressure Switch
Figure 401

OIL FILTER CLOGGING INDICATING - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001, 002)
   Two pressure tappings are provided, one upstream and the other downstream of the main filter, which permit monitoring of the pressure drop across the filter elements. These pressures are applied across a switch the contacts of which are made on increasing pressure at 50 ± 2 psid and broken on decreasing pressure at 40 ± 2 psid. This switch sends a signal to both OIL CLOG warning light and the ECAM display unit :
   - to illuminate amber OIL CLOG caution light 3EF (4EF) on main instrument panel 4VU.
   - to illuminate amber MASTER CAUTION light and trigger the single chime.
   - to activate the left ECAM display unit which will give instructions to the crew members, and to call the ENGINE page on the right ECAM display unit.

   The oil filter bypass is set to crack open at 65 psid min and to be fully open at 90 psid max.

R

**ON A/C 101-104,

Post SB 72-2030 For A/C 101-104,

OIL FILTER CLOGGING INDICATING - DESCRIPTION AND OPERATION

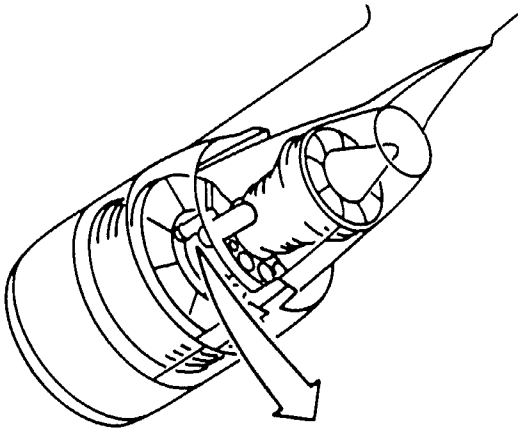
1. General (Ref. Fig. 001, 002)
   Two pressure tappings are provided, one upstream and the other downstream of the main filter, which permit monitoring of the pressure drop across the filter elements. These pressures are applied across a switch the contacts of which are made on increasing pressure at 50 ± 2 psid and broken on decreasing pressure at 40 ± 2 psid. This switch sends a signal to both OIL CLOG warning light and the ECAM display unit :
   - to illuminate amber OIL CLOG caution light 3EF (4EF) on main instrument panel 4VU.
   - to illuminate amber MASTER CAUTION light and trigger the single chime.
   - to activate the left ECAM display unit which will give instructions to the crew members, and to call the ENGINE page on the right ECAM display unit.

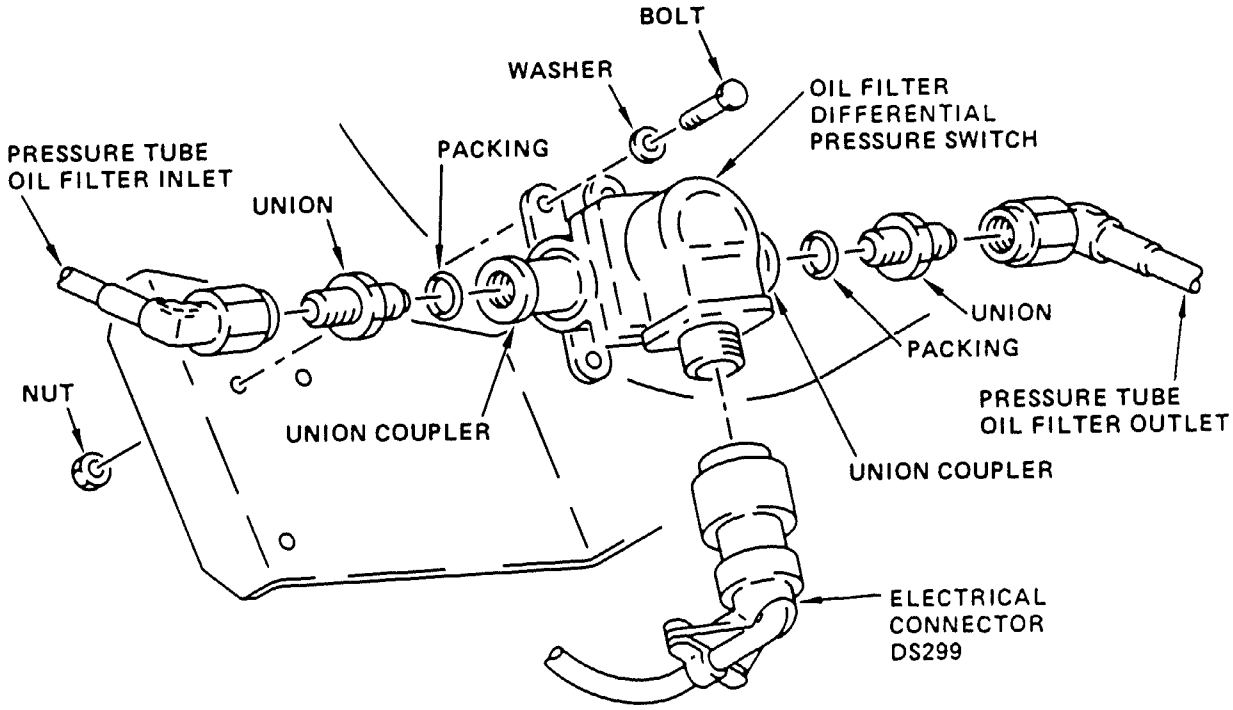
   The oil filter bypass is set to crack open at 65 psid min and to be fully open at 90 psid max.

R

**ON A/C 101-200,

2. Component location
   (Ref. Fig. 003)





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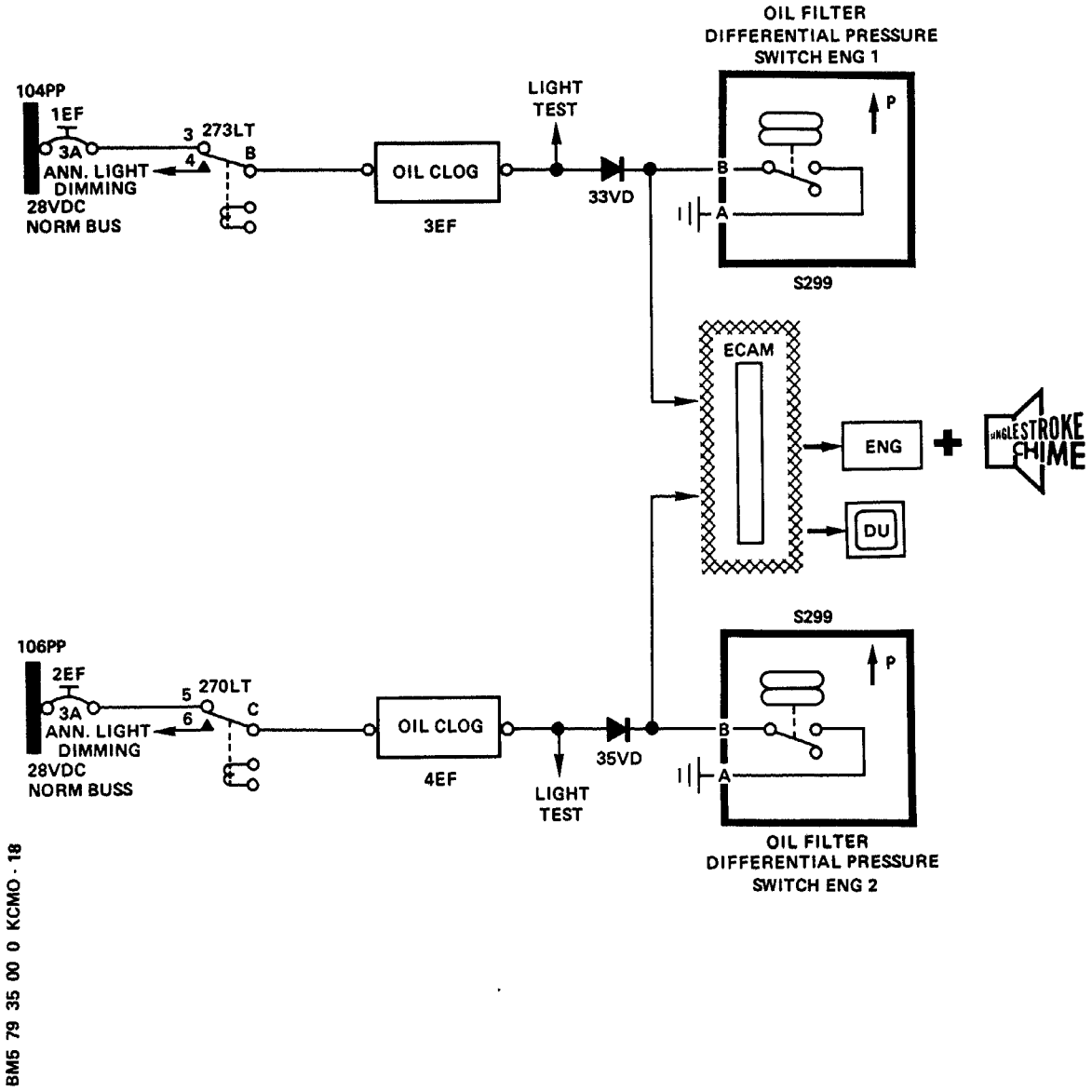
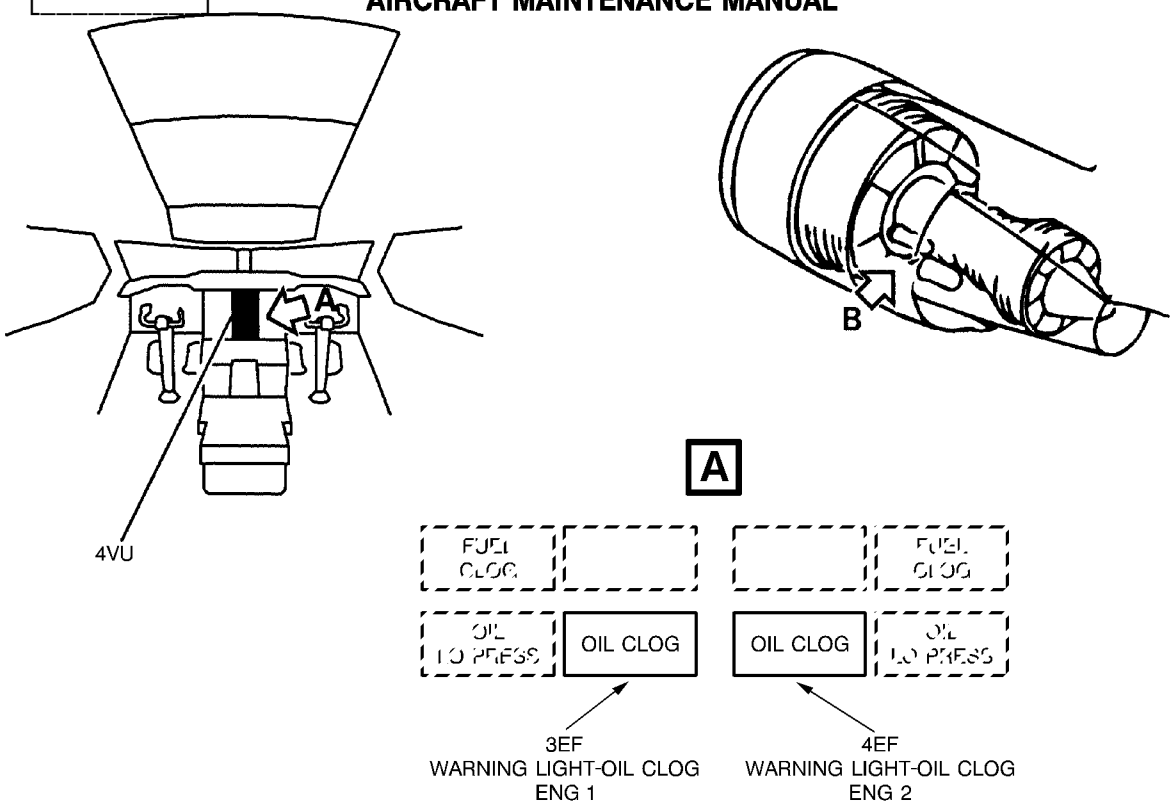
Oil Filter Differential Pressure Switch - Location
Figure 001



Oil Filter Clogging - Electrical Circuit
Figure 002

FIN	FUNCTIONAL DESIGNATION	PANEL	ZONE	ACCESS DOOR	ATA REF.
S299	SWITCH - OIL FILTER DIFFERENTIAL ENG1 (ENG2)				79-35-11
3EF	WARNING LIGHT - OIL CLOG	4VU	211		79-35-00
(4EF)	ENG1 (ENG2)	4VU	212		



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Oil Pressure Clogging Indicating - Component Location
Figure 003

OIL FILTER CLOGGING INDICATING - ADJUSTMENT/TEST

1. Functional Test

A. Reason for the Job
This procedure provides instructions and information for functional test of engine oil filter differential pressure switch.

B. Equipment and Materials

ITEM	DESIGNATION
(1)Material No.P03-001	Oils (Ref. 70-00-00)
(2)	Container Suitable for Oil
(3)	HP Pressure Source
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-00-00, P. Block 501	Power Plant - General
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 79-35-11, P. Block 401	Oil Filter Clogging Switch
- 24-41-00, P. Block 301	AC External Power Control
- 31-51-00, P. Block 1	ECAM System

C. Procedure
(1)Job set-up
(a)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(b)Position a container under the oil filter inlet and outlet ports.
(c)Disconnect tube couplings at elbows (Ref. 79-35-11, P. Block 401).
(d)Connect the compressed air source to the oil pressure inlet.
(e)Energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).
(f)Make certain that electronics racks ventilation is correct.
(g)Make certain that ECAM system is operating (Ref. 31-51-00, P. Block 1)
(h)Make certain that following circuit breakers are closed :

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES/ENG1/OIL CLOG	1EF	331/V71
133VU	ENGINES/ENG2/OIL CLOG	2EF	332/U73

(2)Test

ACTION	RESULT
1. Supply compressed air at a pressure between 48 and 52 psi	- On panel 4VU OIL CLOG warning light comes on - On capt and F/O main instrument panels 3VU and 5VU MASTER CAUTION lights come on - Single chime sounds - Warning message automatically

ACTION	RESULT
	appears on L ECAM display unit and engine system page appears on R ECAM display unit
2. Slowly reduce air pressure to 40 ± 2 psi and stabilize it at this pressure.	- OIL CLOG warning light on panel 4VU together with MASTER CAUTION lights on Capt and F/O main instrument panels 3VU and 5VU are off. - The last page on L ECAM and R ECAM display units disappears.

(3)Close-up
(a)Reduce air pressure to 0 psi and disconnect compressed air sources
(b)Connect tube couplings at elbows (Ref. 79-35-11, P. Block 401).
(c)Remove safety clip and tag and close circuit breaker ENG1 & 2/ START/CTL &/WARN 1KG.
(d)Perform dry motoring of the engine envolved (Ref. 71-00-00, P. Block 501) and check couplings for leakage.
(e)Check oil level (Ref. 12-13-79, P. Block 1).
(f)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(g)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(h)De-energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).

OIL FILTER CLOGGING INDICATING - DEACTIVATION/REACTIVATION

Ref. : MMEL Sect. 1-79, Item 4 ("OIL CLOG" lt.)

1. Reason for the Job
   Failure of oil filter clogging indicating system.

2. Equipment and Materials

	ITEM	DESIGNATION
	A. Material No.P03-001	Oils (Ref. 70-00-00)
R	B. Material No.P11-027	Cleaning Agents (Ref. 70-00-00)
R	C.	Warning Notice
R	D.	Circuit Breakers Safety Clips
	Referenced Procedures	
	- 71-13-00, P. Block 301	Cowl Doors
	- 71-00-00, P. Block 501	Power Plant - General
	- 12-13-79, P. Block 1	Engines (Engine Oil System)
	- 79-21-03, P. Block 401	Oil Filter
R	- 79-22-03, P. Block 601	Magnetic Chip Collectors

3. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Deactivation
(1)Remove the main oil filter (Ref. 79-21-03, P. Block 401).
R (2)Check the filter for contamination.
R (a)Flush the filter with Material No.P11-027.
R (b)Strain the solvent through filter paper or clean cloth. Keep the debris contamination for identification.
R (c)If there is contamination, do the inspection of the oil system for contamination (Ref. 79-22-03, P. Block 601).
R (3)Install a new main oil filter (Ref. 79-21-03, P. Block 401).
(4)Install a warning notice in flight compartment indicating that filter clogging indicating system is inoperative.

C. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Check oil level in oil tank. Use Material No.P03-001 to add oil if required (Ref. 12-13-79, P. Block 1).
(3)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(4)Perform idle leak check (Ref. 71-00-00, P. Block 501 Test No. 3).
(5)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301) and check for leakage. Close thrust reverser and fan cowl doors.

OIL FILTER DIFFERENTIAL PRESSURE SWITCH - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Protective Covers
C.	Container
D.	Packing
E.	Torque Wrench
F. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES/ENG1 OIL CLOG	1EF	331/V71
FOR ENGINE 2			
133VU	ENGINES/ENG2 OIL CLOG	2EF	332/U73

(2)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)

(1)Disconnect electrical connector DS299 and place protective covers on connector and receptacle.

(2)Position oil container under switch.

WARNING : WHEN PERFORMING MAINTENANCE ON AN ENGINE THAT HAS BEEN RECENTLY USED OR RUN, EXERCISE CAUTION WHEN DISCONNECTING OIL LINES, AS HOT ENGINE OIL CAN CAUSE SERIOUS INJURY TO EYES OR SEVERE BURNS TO PERSONNEL.

(3)Disconnect oil filter inlet pressure and outlet pressure line couplers at union connectors on switch.

(4)Place protective covers on all open oil lines and ports.

(5)Remove nuts, washers and bolts that fasten switch to mounting bracket and remove switch.

C. Installation (Ref. Fig. 401)

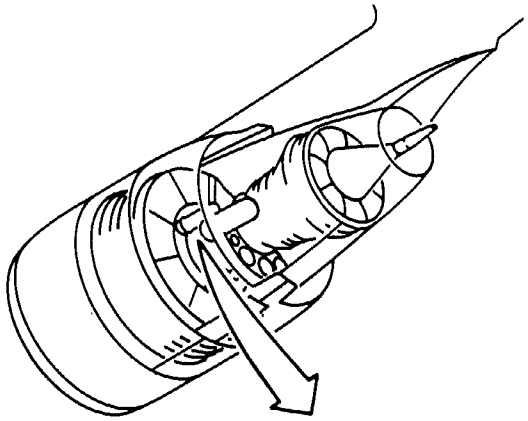
(1)Remove all protective covers

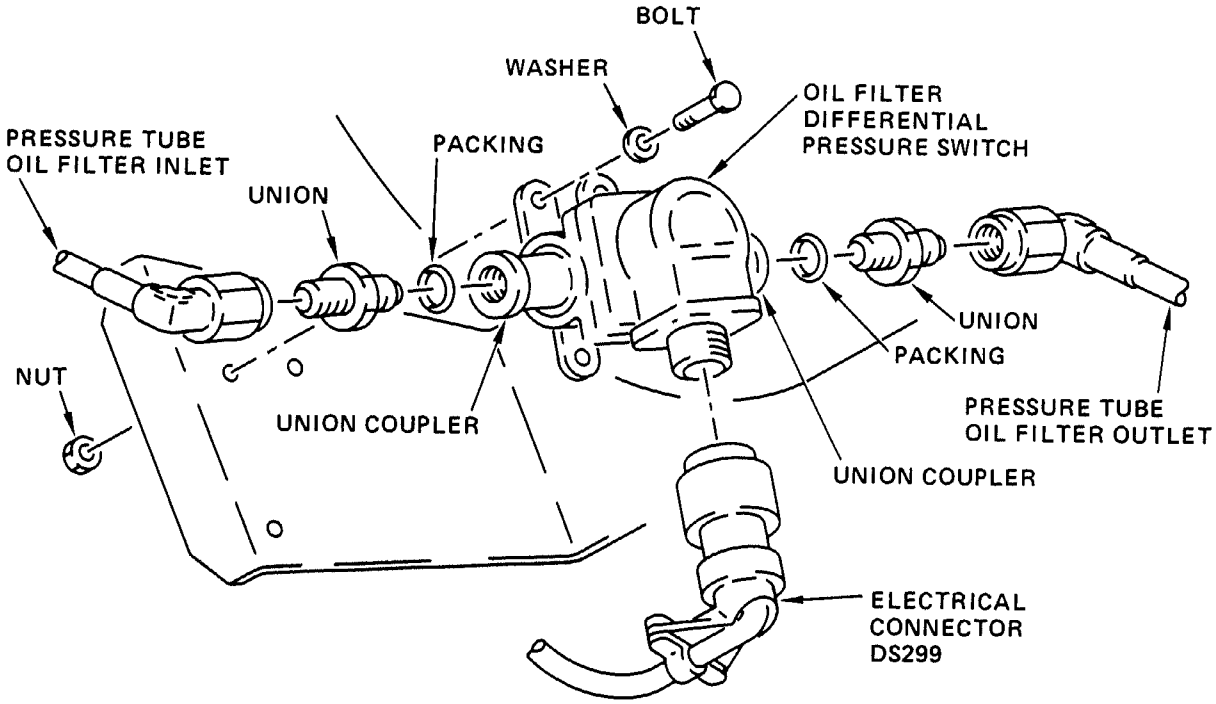
(2)Lubricate bolts with Material No.P03-001

(3)Install oil filter differential pressure switch on mounting bracket with bolts, washers and nuts. TORQUE bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(4)Install union couplers as follows :
(a)Lubricate packing with Material No.P03-001 and position on union coupler.
(b)Install coupler fingertight.
(c)Torque coupler to between 90 and 100 lbf.in. (1.02 and 1.13 daN).
(5)Connect oil filter inlet pressure and outlet pressure lines at union connectors fingertight and then TORQUE to between 135 tand 150 lbf. in. (1.53 and 1.70 m.daN).
NOTE : External tubing 37 degree conical seats exhibiting minor scratches, minor defects on sealing surface or seats which have had excessive material removed during repair may be repaired by the installation of a Voi-Shan seal per 71-09-71, Approved Repair-01.
(6)Connect electrical connector DS299 fingertight. Then tighten an additional one-eighth turn.

D. Close-Up
(1)Service engine oil system (Ref. 12-13-79, P. Block 1).
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(4)Remove safety clips and tags and close circuit breakers : 1EF, 2EF.
(5)Test engine as per Test Reference Table (Ref. 71-00-00, P. Block 501).





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Oil Filter Differential Pressure Switch
Figure 401